iSR6200
QLogic intelligent Storage Router (iSR)

Installation Guide

ISR651101-00 H

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Changes	Sections Affected
Updated to latest QLogic template, including new notes, cautions, and warnings.	All
Updated guide title from *iSR6200 Intelligent Storage Router Installation Guide* to *iSR6200 QLogic intelligent Storage Router (iSR) Installation Guide*.	Front cover and guide headers
Updated the note, caution, and warning descriptions.	“Documentation Conventions” on page xv
Updated the related materials section to refer to information on downloading documentation.	“Related Materials” on page xiv
Updated the VCCI Class A Statement and added the new BSMI Class A Statement.	“Communications Statements” on page xvii
Updated the referenced standards list.	“CE Statement” on page xviii
Updated the QLogic technical support and training information, including a new section on Downloading Updates.	“Technical Support” on page xx
Added new section title.	“Router Capabilities and Features” on page 1-1
Added new section.to describe licensed feature, Data Migration.	“Licensed Features” on page 1-2
Added new section describing support of inter-connecting remote SAN island	“Remote SAN Island Connectivity” on page 1-2

Added new topology section and diagram.	“Topology” on page 2-7
Made minor editorial changes to text to enhance understanding.	Chapter 4 Configuration
Updated screen shots for Figure 4-1, Figure 4-2, and Figure 4-4.	“Enabling Virtual Port Groups” on page 4-2
Updated screen shot for Figure 4-14.	“Connecting iSCSI Hosts to the iSR6200” on page 4-16
Changed “LUN masking” reference to “LUN mapping”; replaced and renamed Figure 4-24.	“Controlling per-Host LUN Access on the iSR6200” on page 4-23

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Preface

This user's guide describes and provides installation procedures for the QLogic® iSR6200 Series intelligent Storage Router (iSR) (iSR6200), also referred to as the *iSR6200 router* or simply *router*.

Intended Audience

This guide is for users who are responsible for installing, managing, and servicing the iSR6200 router and the SAN equipment to which it is attached.

What's in This Guide

This guide contains the information needed to install and configure the iSR6200 router. This preface explains the typographic conventions used in this guide, lists related documents, and specifies the intended audience. This section also provides safety and communications statements, a well as technical support and contact information.

The remainder of the user's guide is organized into the following chapters and appendices:

- Chapter 1 Introduction illustrates and describes QLogic's iSR6200 intelligent Storage Router (iSR), including the components contained within the iSR6200 router chassis: router blades and power and cooling modules (PCMs).
- Chapter 2 Planning describes how to plan for the iSR6200 router by considering the devices it needs to support, Fibre Channel and iSCSI port performance requirements, performance tuning, high availability (HA), network management, disaster and recovery, services, and system security.
- Chapter 3 Installation provides site requirements and describes how to install and configure an iSR6200 router. It also provides firmware installation instructions.
- Chapter 4 Configuration describes how to configure the iSR6200 router to support virtual port groups (VPGs) and LUN mapping.
- Chapter 5 Fibre Channel over IP describes the FCIP protocol attributes and configuration.

- Chapter 6 Diagnostics and Troubleshooting provides system diagnostic and troubleshooting tools available for the iSR6200 router.
- Chapter 7 Removal and Replacement describes how to remove and replace the following field replaceable units (FRUs): small form-factor pluggable (SFP) transceivers, iSR6200 chassis blades, and PCMs.
- Appendix A Technical Specifications summarizes the technical aspects of the iSR6200 router, including the interface, expansion configurations, performance features, iSCSI initiator support, device management, mechanical components, high availability features, data migration, supported protocols, and environment and safety measurements.
- Appendix B Simple Network Management Protocol provides reference material for the simple network management protocol (SNMP), which you can use to manage the iSR6200 router using a third-party SNMP management application.
- Appendix C Log Messages provides reference material on messages logged to a file, which you can retrieve using either the command line interface (CLI) (see the *iSR6200 Command Line Interface (CLI) User's Guide)* or SANsurfer Router Manager (see the *iSR6200 Router Manager User's Guide*).

Following the appendices are a glossary of terms used and an index to help you quickly find the information you need.

Related Materials

For additional information, refer to the following documents:

- *iSR6200 Router Quick Start Guide*, part number IS0054504-00
- *iSR6200 Storage Router Rack Mounting Guide*, part number ISR653401-00
- *iSR6200 Command Line Interface (CLI) User's Guide*, part number ISR654601-00
- *iSR6200 Router Manager User's Guide*, part number ISR654602-00
- *Internet Protocol, Version 6 (IPv6) Specification*, RFC2460
- *Neighbor Discovery for IP Version 6 (IPv6)*, RFC2461
- *IPv6 Stateless Address Autoconfiguration*, RFC2462
- *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*, RFC2463
- *Transmission of IPv6 Packets over Ethernet Networks*, RFC2464
- *iSCSI draft standard deaft-ietf-ips-iSCSI-20*

- *Internet engineering task force (IETF): iSCSI Requirements and Design Considerations, iSCSI Naming and Discovery, Internet Protocol Specification (IPv4)*, RFC793
- *Transmission Control Protocol (TCP) Specification, RFC1122, Requirements for Internet Hosts-Communication Layers*
- *TCP Extensions for High Performance*, RFC1323
- *TCP Congestion Control*, RFC2581
- *ANSI SCSI: SCSI-3 Architecture Model (SAM), X3T10/994D/Rev 18, SCSI-3 Controller Command Set, X3T10/Project 1047D/Rev 6c. IEEE: 802.1Q Virtual LAN (VLAN), 802.1p Priority of Service, 802.3x Flow Control, 802.3ad Link Aggregation*
- *SCSI-3 Fibre Channel Protocol (SCSI-FCP)*, X3.269:1996
- *Fibre Channel Physical and Signaling Interface (FC-PH)*, X3.230:1994
- *Fibre Channel 2nd Generation (FC-PH-2)*, X3.297:1997
- *Third Generation Fibre Channel Physical and Signaling Interface (FC-PH-3), X3.303:1998*
- *Fibre Channel-Arbitrated Loop (FC-AL-2)*, working draft, revision 6.4, August 28, 1998
- *Fibre Channel Fabric Loop Attachment Technical Report (FC-FLA) NCITS/TR-20:1998, Fibre Channel-Private Loop Direct Attach Technical Report (FC-PLDA)*
- *SCSI Fibre Channel Protocol-2 (FCP-2)* working draft, revision 3, October1, 1999
- *ANSI Information Technology-SCSI 3 Architecture Model*, revision 18, November 27, 1995

For information about downloading documentation from the QLogic Web site, see “Downloading Updates” on page xx.

Documentation Conventions

This guide uses the following documentation conventions:

- **NOTE** provides additional information.
- **CAUTION** without an alert symbol indicates the presence of a hazard that could cause damage to equipment or loss of data.
- ⚠**CAUTION** with an alert symbol indicates the presence of a hazard that could cause minor or moderate injury.

- ⚠**WARNING** indicates the presence of a hazard that could cause serious injury or death.
- Text in blue font indicates a hyperlink (jump) to a figure, table, or section in this guide. Links to Web sites are shown in underlined blue. For example:
  - Table 9-2 lists problems related to the user interface and remote agent.
  - See "Installation Checklist" on page 3-6.
  - For more information, visit www.qlogic.com.
- Text in **bold** font indicates user interface elements such as a menu items, buttons, check boxes, or column headings. For example:
  - Click the **Start** button, point to **Programs**, point to **Accessories**, and then click **Command Prompt**.
  - Under **Notification Options**, select the **Warning Alarms** check box.
- Text in `Courier` font indicates a file name, directory path, or command line text. For example:
  - To return to the root directory from anywhere in the file structure: Type `cd /root` and press ENTER.
  - Enter the following command: `sh /install.bin`
- Key names and key strokes are indicated with UPPERCASE:
  - Press CTRL+P.
  - Press the UP ARROW key.
- Text in *italics* indicates terms, emphasis, variables, or document titles. For example:
  - For a complete listing of license agreements, refer to the *QLogic Software End User License Agreement*.
  - What are *shortcut keys*?
  - To enter the date, type *mm/dd/yyyy* (where *mm* is the month, *dd* is the day, and *yyyy* is the year).
- Topic titles between quotation marks identify either sections within this guide or topics in the online help, which is also referred to as *the help system* throughout this document.

Communications Statements

The following statements apply to this product. The statements for other products intended for use with this product appear in their accompanying manuals.

Federal Communications Commission (FCC) Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause unacceptable interference, in which case the user will be required to correct the interference at their own expense.

Neither the provider nor the manufacturer is responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause unwanted operation.

Canadian Department of Communications Class A Compliance Statement

This equipment does not exceed Class A limits for radio emissions for digital apparatus, set out in Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps necessary to correct the interference.

Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques por les appareils numériques, telles que prescrites par le Réglement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécwssaires pour en éliminer les causes.

CE Statement

The CE symbol on the equipment indicates that this system complies with the EMC (Electromagnetic Compatibility) directive of the European Community (89/336/EEC) and to the Low Voltage (Safety) Directive (73/23/EEC). Such marking indicates that this system meets or exceeds the following technical standards:

- EN60950-1: *Safety of Information Technology Equipment, Including Electrical Business Equipment*
- EN 55022: *Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment*
- EN 55024: *Electromagnetic compatibility—Generic immunity standard Part 1: Residential commercial, and light industry*
  - EN 61000-4-2: *Electrostatic Discharge Immunity Test*
  - EN 61000-4-3: *Radiated, Radio-Frequency, Electromagnetic Field Immunity Test*
  - EN 61000-4-4: *Electrical Fast Transient/Burst Immunity Test*
  - EN 61000-4-5: *Surge Immunity Test*
  - EN 61000-4-6: *Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields*
  - EN 61000-4-8: *Power Frequency Magnetic Field Immunity Test*
  - EN 61000-4-11: *Voltage Dips, Short Interruptions And Voltage Variations Immunity Tests*
- EN 61000-3-2: *Limits For Harmonic Current Emissions (Equipment Input Current Less Than/Equal To 16 A Per Phase) Class A*
- EN 61000-3-3: *Limitation Of Voltage Fluctuations And Flicker In Low-Voltage Supply Systems For Equipment With Rated Current Less Than Or Equal To 16 A*

VCCI Class A Statement

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。　　VCCI－A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

BSMI Class A Statement

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take adequate measures.

Laser Safety Information

This product may use Class 1 laser optical transceivers to communicate over the fiber optic conductors. The U.S. Department of Health and Human Services (DHHS) does not consider Class 1 lasers to be hazardous. The International Electrotechnical Commission (IEC) 825 Laser Safety Standard requires labeling in English, German, Finnish, and French stating that the product uses Class 1 lasers. Because it is impractical to label the transceivers, the following label is provided in this manual.

CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1
TO IEC 825 (1984) + CENELEC HD 482 S1

Electrostatic Discharge Sensitivity (ESDS) Precautions

The assemblies used in the switch chassis are electrostatic discharge sensitive. Observe ESDS handling procedures when handling any assembly used in the switch chassis.

Accessible Parts

The the iSR6200 router supports the following FRUs:

- iSR6200 chassis blades
- PCMs
- SFP optical transceivers

License Agreements

Refer to the *QLogic Software End User License Agreement* for a complete list of all license agreements affecting this product.

Technical Support

Customers should contact their authorized maintenance provider for technical support of their QLogic products. QLogic-direct customers may contact QLogic Technical Support; others will be redirected to their authorized maintenance provider. Visit the QLogic support Web site listed in Contact Information for the latest firmware and software updates.

For details about available service plans, or for information about renewing and extending your service, visit the Service Program Web page at http://www.qlogic.com/services.

Downloading Updates

The QLogic Web site provides periodic updates to product firmware, software, and documentation.

To download firmware, software, and documentation:

1. Go to the QLogic Downloads and Documentation page:

   http://driverdownloads.qlogic.com

2. Under **QLogic Products**, type the QLogic model name in the search box.

   Alternatively, you can click **Guided Search** to obtain assistance in locating the firmware and documentation to download.

3. In the search results list, locate and select the firmware, software, or documentation for your product.
4. View the product details Web page to ensure that you have the correct firmware, software, or documentation. For additional information, click the **Read Me** and **Release Notes** icons under **Support Files**.
5. Click **Download Now**.
6. Save the file to your computer.
7. If you have downloaded firmware or software, follow the installation instructions in the *Readme* file.

Training

QLogic Global Training maintains a Web site at www.qlogictraining.com offering online and instructor-led training for all QLogic products. In addition, sales and technical professionals may obtain Associate and Specialist-level certifications to qualify for additional benefits from QLogic.

Contact Information

QLogic Technical Support for products under warranty is available during local standard working hours excluding QLogic Observed Holidays. For customers with extended service, consult your plan for available hours. For Support phone numbers, see the Contact Support link at support.qlogic.com.

Support Headquarters	QLogic Corporation 4601 Dean Lakes Blvd. Shakopee, MN 55379 USA
QLogic Web Site	www.qlogic.com
Technical Support Web Site	http://support.qlogic.com
Technical Support E-mail	support@qlogic.com
Technical Training E-mail	training@qlogic.com

Knowledge Database

The QLogic knowledge database is an extensive collection of QLogic product information that you can search for specific solutions. We are constantly adding to the collection of information in our database to provide answers to your most urgent questions. Access the database from the QLogic Support Center: http://support.qlogic.com.

1 Introduction

This chapter illustrates and describes QLogic's iSR6200 intelligent Storage Router (iSR), including the components contained within the iSR6200 router chassis: router blades, chassis mid-plane, and PCMs.

The following sections describe the features and capabilities of the iSR6200 router:

- "Router Capabilities and Features" on page 1-1
- "Licensed Features" on page 1-2
- "Remote SAN Island Connectivity" on page 1-2
- "iSR6200 Router Chassis" on page 1-3
- "Power and Cooling Module (PCM)" on page 1-5
- "iSR6200 Router Blades" on page 1-6

Router Capabilities and Features

The iSR6200 router is designed to provide:

- Storage consolidation on Fibre Channel arrays by providing iSCSI server connectivity for Fibre Channel arrays.
- Solution for distance replication and backup by providing SAN over WAN connectivity.

The iSR6200 router provides the following features:

- Cost-effective connectivity
- Scalability, reliability, and interoperability
- Ease of use
- Rack real estate
- PCM
- HA configurations
- OEM multipath software

Licensed Features

The iSR6200 router has features that are available by a license key.

Data Migration

The iSR6200 router provides data migration as an optional, licensed feature.

The iSR6200-based data migration feature is block-based and independent of a SAN, server, storage protocol (Fibre Channel and iSCSI), and storage vendor. Because application downtime during data migration is always critical, iSR6200 data migration supports both online (local and remote) and offline data migration across Fibre Channel and iSCSI storage arrays. Even offline data migration using the iSR6200 is designed to minimize application downtime by allowing you to configure all migration related tasks while the application remains online, and to migrate the data at a very high speed while the application is offline. This feature is designed such that any person with knowledge of SAN or SAN storage administration can migrate data.

Remote SAN Island Connectivity

The iSR6200 router supports inter-connecting remote SAN islands, as shown in Figure 1-1.

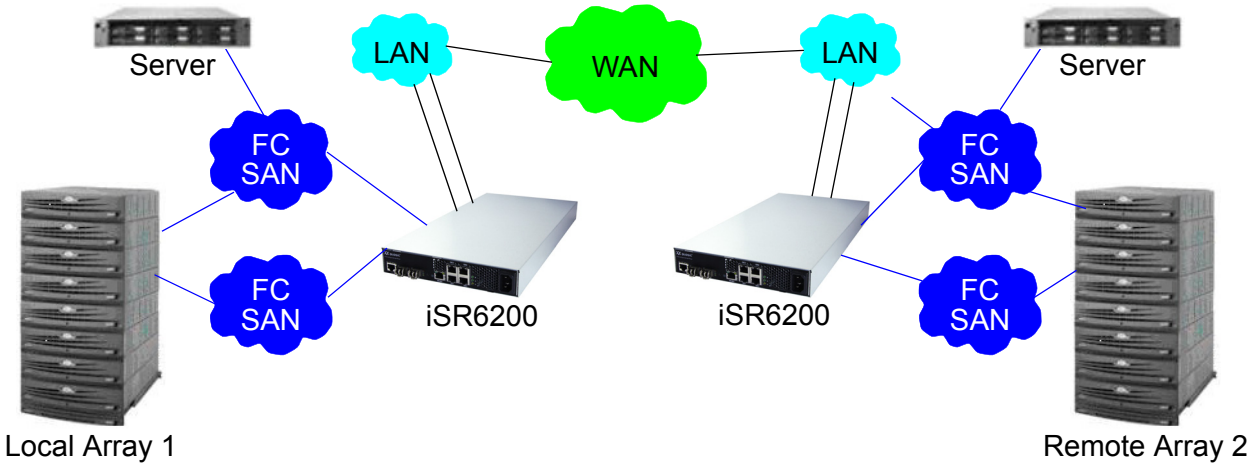


Figure 1-1. Remote SAN Island Connectivity

This configuration has the following additional requirements:

- At least one Fibre Channel port of iSR6200 connected to Fibre Channel SAN.
- Accessibility between the GbE ports on the router, port IP addresses of the remote router, and GbE port IP addresses of the local routers.
- Accessibility between the remote iSR6200 management port IP address and local iSR6200 management port IP address.

When connecting SANs over long distances, you must determine the round-trip latencies between two router connections. You can discover these round-trip latencies using the `ping` command in the CLI. (See the *iSR6200 Command Line Interface (CLI) User's Guide*.)

Using this round-trip latency number, you can determine the window scaling factor for GbE port, as described in "Performance Tuning" on page 2-4. By default, window scaling is set to 1 (64K) TCP window size.

To map remote Fibre Channel devices to a local SAN:

1. If the remote router is not already associated with a local router, associate the two routers with each other using one of these user interfaces:
   - ❑ The Add Remote Router wizard (see the *iSR6200 Router Manager User's Guide*).
   - ❑ The CLI command `remotepeer add` (see the *iSR6200 Command Line Interface (CLI) User's Guide*).
2. Create the initiator to target mapping using one of these methods:
   - ❑ The Map Remote Initiator/Target wizard (see the *iSR6200 Router Manager User's Guide*).
   - ❑ The CLI `remotemap add` command (see the *iSR6200 Command Line Interface (CLI) User's Guide*).

iSR6200 Router Chassis

The iSR6200 router chassis includes the following hardware components:

- Full-wide, 1U, rack mount
- Two bays for hot-replaceable ISR blades
- Two bays for hot-replaceable PCMs
- One mid-plane with two × EEPROMs
- Dual 275-watt power supplies

The iSR6200 router chassis contains one or two router blades, along with a PCM for each blade. Figure 1-2 illustrates an iSR6200 chassis with two router blades installed.

Figure 1-2. iSR6200 Router

Figure 1-3 shows the front and back plates on an iSR6200 router chassis that contains two iSR6200 blades with optional ports installed in the options panel.

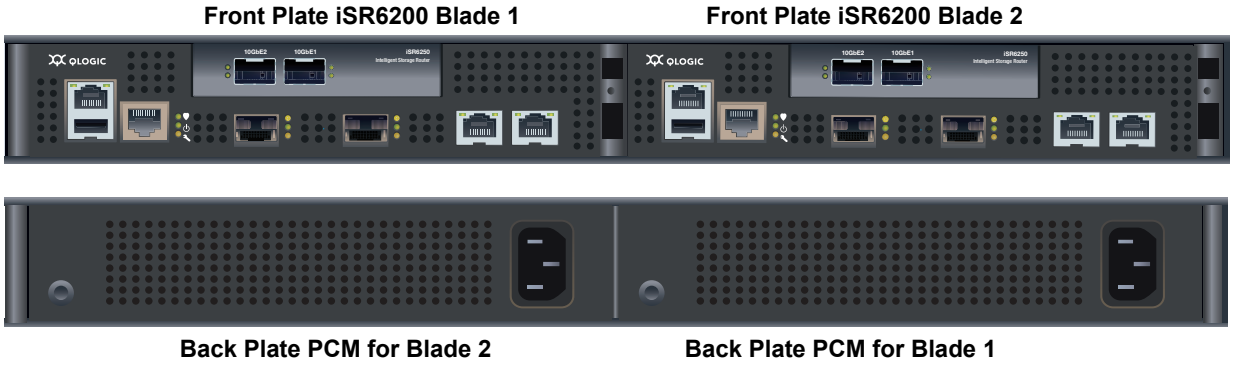


Figure 1-3. iSR6200 Router Chassis—Front and Back Plates

Power and Cooling Module (PCM)

Each iSR6200 chassis blade has a PCM located on the backside of the chassis, as shown in Figure .

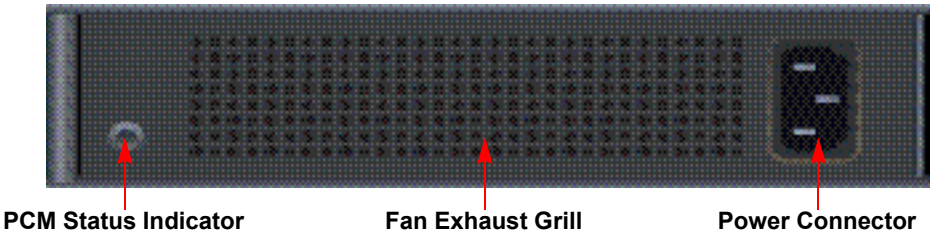


Figure 1-4. PCM—Back Plate

Each PCM consists of one power supply, three fans, and one external status light emitting diode (LED), as shown in Figure 1-5.

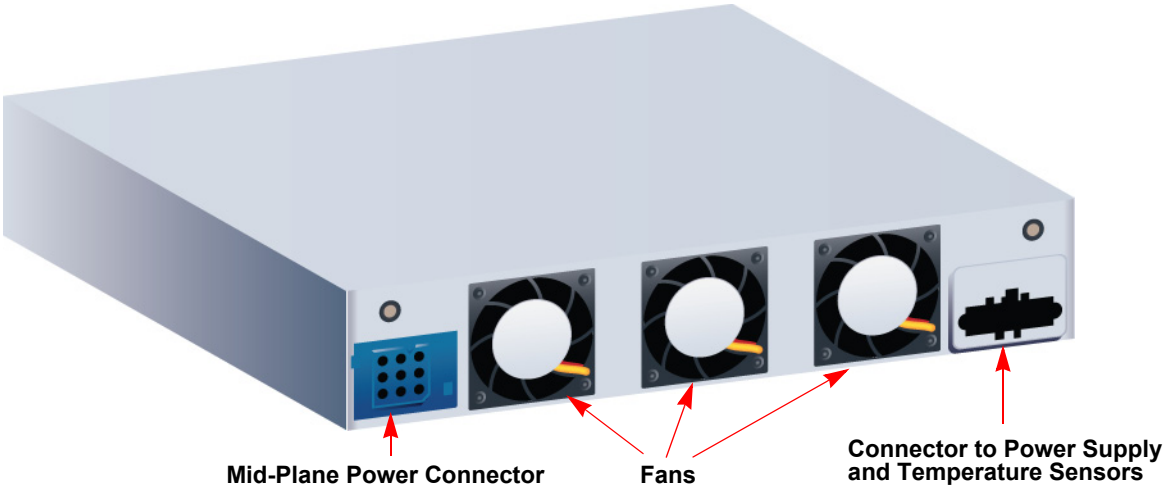


Figure 1-5. PCM—Front

Each blade is capable of simultaneously driving all six fans in both PCMs. Generally, only one blade controls both fans, running them at a normal speed. However, if the system detects a higher-than-expected temperature on either side of the blade, it forces the fans to run at full speed. After the temperature is back to normal, the fans resume running at their normal speed.

Table 1-1 shows the internal temperature limits set to trigger events or server message block (SMB) alerts.

Table 1-1. Internal Temperature Sensor Limits

Sensor	High Fan Speed Temperature	Low Fan Speed Recovery Temperature	Critical Temperature (power off)	SMB_Alert Recovery Temperature
Front	60°C	55°C	70°C	55°C
Rear	45°C	40°C	55°C	45°C
CPU1	60°C	55°C	68°C	55°C
CPU2	60°C	55°C	68°C	55°C

The following describes the fan speed and temperature parameters listed in Table 1-1.

- **High Fan Speed Temperature**—When a sensor detects a temperature that exceeds this value, the fans run at their maximum RPM speed. The system logs the event and the system fault LED blinks five times every two seconds.
- **Low Fan Speed Recovery Temperature**—When the fans are running at their maximum RPM and all sensors report values less than this value, the fan speed resets to normal.
- **Critical Temperature**—When a sensor detects a temperature that exceeds this value, the system powers down the blade. When this happens, the CPUs enter sleep state 5. The system sets the peripheral component interface (PCI) power state of capable devices to D3, and then turns off the power supplies not essential to wake up the CPUs. When the temperature goes below the **Recovery Temperature** value, the sensor that reported the over-temperature value generates an SMB_ALERT.
- **Recovery Temperature**—Value at which a sensor generates an SMB_ALERT to wake up the CPU and cause the blade to reboot.

iSR6200 Router Blades

Each chassis supports one or two hot-pluggable blades. The base configuration of an iSR6200 router blade has a dual-core CPU, 1,024MB memory, boot Flash, and internal and external I/O ports. (For detailed specifications, see Appendix A.)

The following sections illustrate and describe the physical features and functionality of the iSR6200 router blades:

- "iSR6200 Router Family Models" on page 1-7
- "Router Blade LEDs" on page 1-9
- "Maintenance Button" on page 1-10
- "Fibre Channel Port LEDs" on page 1-12
- "Fibre Channel Transceivers" on page 1-13
- "Gigabit Ethernet Port LEDs" on page 1-14
- "Ethernet Port—Management" on page 1-14
- "Serial Port" on page 1-15

iSR6200 Router Family Models

The iSR6200 family includes router models distinguished by their expansion ports, located in the top-center area of each router blade. The following sections identify the add-on ports on the different iSR6200 router models:

- "iSR6260 Router Blade" on page 1-7
- "iSR6250 Router Blade" on page 1-7
- "iSR6240 Router Blade" on page 1-8

iSR6260 Router Blade

The iSR6260 router blade adds two more Fibre Channel ports to the blade configuration. Each port has the following capacity:

- Auto-negotiating transmission rates of 2, 4, or 8Gb
- Hot-pluggable SFP Fibre Channel connector
- N_Port, NL_Port, or transparent port type

Figure 1-6. Fibre Channel Ports on the iSR6260 Router Blade

iSR6250 Router Blade

The iSR6250 router blade adds two 10Gb Ethernet (GbE) ports to the blade configuration. Each port has the following capacity:

- 10GbE iSCSI ports that run in full duplex mode
- Support for jumbo frames

- IPv4 and IPv6 protocol support
- iSCSI header and data digest in the software

Figure 1-7. 10GbE Ports on the iSR6250 Router Blade

Table 1-2. 10GbE Port LED Scheme

Green LED (SAN Traffic [a])	Green LED (LAN Traffic)	Activity
Off	Off	Power off
Slow flashing (in unison)	Slow flashing (in unison)	Power on (no link)
On	On	Link established, no activity
On	Flashing	Link established, transmit and receive LAN only activity
Flashing	On	Link established, transmit and receive SAN only activity
Flashing	Flashing	Link established, transmit and receive LAN and SAN activity
Slow flashing (alternating)	Slow flashing (alternating)	Beaconing

[a] SAN traffic refers to FCoE traffic.

iSR6240 Router Blade

The iSR6240 router blade adds two iSCSI Ethernet ports to the blade configuration. Each port has the following capacity:

- Auto negotiating transmission rates of 100Mbps and 1000Mbps
- Full duplex transmission mode
- Support for jumbo frames (at 1000Mbps only)
- RJ45 copper Ethernet connector type
- iSCSI header and data digest in the hardware
- IPv4 and IPv6 protocol support
- iSCSI offload

Figure 1-8. iSCSI (GE) Ports on the iSR6240 Router Blade

Router Blade LEDs

Each chassis blade provides LEDs and connectors that face the front of the chassis and may also provide expansion ports, depending on its model. The router blade LEDs shown in Figure 1-9 provide information about the router's operational status. These LEDs include the heartbeat LED, the system fault LED, and the input power LED. The blade also includes a recessed beacon indicator used to locate the physical blade monitored using SANsurfer Router Manager.

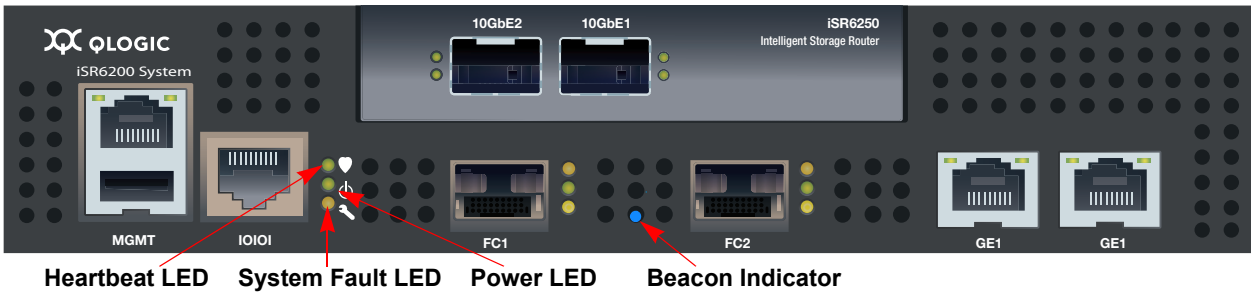


Figure 1-9. Router Blade LEDs

Heartbeat LED (Green)

The heartbeat LED blinks once per second as long the router firmware is operational.

System Fault LED (Amber)

The system fault LED lights up to show that a fault exists in the router firmware or hardware. Fault conditions include power on self-test (POST) errors and over-temperature conditions. The LED shows a blink code for POST errors and the over-temperature condition. See Figure 1-9 and Table 1-3.

Table 1-3. System Fault LED Blink Patterns

System Fault LED	Condition
OFF	OK (operational)
1 Blink	Beacon; synchronized with the heartbeat LED
3 Blinks	System error

Table 1-3. System Fault LED Blink Patterns

System Fault LED	Condition
4 Blinks	Management port IP address conflict
5 Blinks	Over-temperature

Input Power LED (Green)

The power LED shows the voltage status of the router logic circuit board. During normal operation, this LED lights up to show that the router logic circuit board is receiving the DC voltage from the power supply.

Beacon Indicator (Blue)

The iSR6200 router blade's printed circuit board (PCB) has a blue beacon light installed near the center vent hole between the Fibre Channel ports (Figure 1-9). This light enables you to locate the physical blade when monitoring the iSR6200 routers using SANsurfer Router Manager. If you enable the **Beacon On** option for a selected blade in SANsurfer Router Manager, the blue beacon light flashes through the vent hole on the chassis blade's faceplate.

Maintenance Button

The maintenance button shown in Figure 1-10 is the only router blade control. Press this button to reset the router blade or to recover it if it becomes disabled.

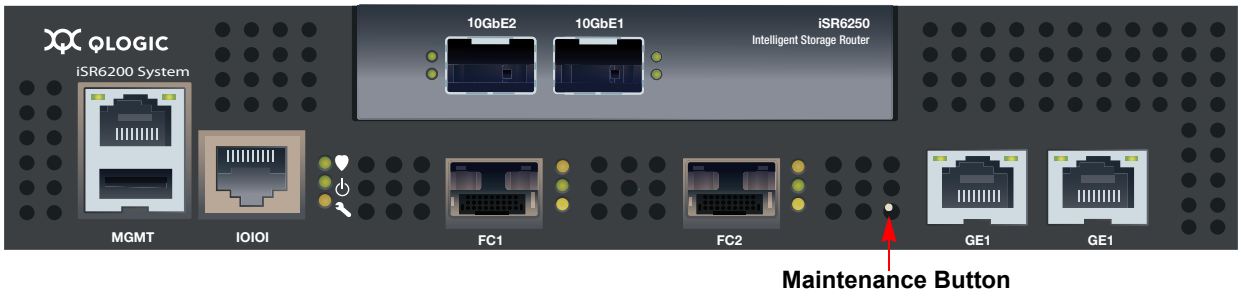


Figure 1-10. Router Blade Controls

The maintenance button is a multifunction momentary switch on the front panel. It has the following functions:

- "Reset a Router Blade" on page 1-11
- "Reset and Select Boot Image" on page 1-11
- "Reset IP Address" on page 1-11

- “Enable DHCP” on page 1-12
- “Restore Factory Defaults” on page 1-12

Reset a Router Blade

To reset the router blade, use a pointed, nonmetallic tool to momentarily press and release (less than two seconds) the maintenance button. The router responds as follows:

1. All the router blade LEDs light up.
2. After about two seconds, the POST begins, turning off the heartbeat and system fault LEDs.
3. When the POST is complete, the power LED is on and the heartbeat LED flashes once per second.

Reset and Select Boot Image

You can reset the router using either the primary or secondary boot image:

- **Primary Image—**To reset the router and select the primary boot image, use a pointed, nonmetallic tool to press and hold the maintenance button until the heartbeat LED flashes once, and then release the button. The router boots from the primary boot image. The boot time is less than one minute.
- **Secondary Image—**To reset the router and select the secondary boot image, use a pointed, nonmetallic tool to press and hold the maintenance button until the heartbeat LED flashes twice, and then release the button. The heartbeat LED flashes twice. The router boots from secondary boot image. The boot time is less than one minute.

Reset IP Address

To reset the router and restore the maintenance port IP address to the default (10.0.0.1), use a pointed, nonmetallic tool to press and hold the maintenance button until the heartbeat LED flashes six times, and then release the button. The router boots and sets the maintenance port to IP address 10.0.0.1. The boot time is less than one minute.

The IP address set by this method is not persistent; to make the change persistent, use the CLI or SANsurfer Router Manager to set the IP address. For more information, see the *iSR6200 Router Manager User’s Guide* and the *iSR6200 Command Line Interface (CLI) User’s Guide*.

Enable DHCP

To reset the router and configure the maintenance port to use dynamic host configuration protocol (DHCP) to acquire its IP address, use a pointed, nonmetallic tool to press and hold the maintenance button until the heartbeat LED flashes seven times, and then release the button. The router boots and configures the maintenance port for DHCP. The boot time is less than one minute.

Enabling DHCP by this method is not persistent; to make the change persistent, use the CLI or SANsurfer Router Manager to enable DHCP. For details, see the see the *iSR6200 Router Manager User's Guide* and the *iSR6200 Command Line Interface (CLI) User's Guide*.

Restore Factory Defaults

To reset the router and restore it to the factory default configuration, use a pointed, nonmetallic tool to press the maintenance button and hold it until the heartbeat LED flashes 20 times, and then release the button. The router boots and is restored to the factory defaults. The boot time is less than one minute.

The router does the following when restored to the factory defaults:

- Clears all router log entries
- Resets all passwords
- Resets the maintenance port IP address to 10.0.0.1
- Disables the iSCSI ports and sets the IP address to 0.0.0.0
- Erases all presentations
- Erases all discovered initiators and targets

Fibre Channel Port LEDs

The iSR6200 router has two Fibre Channel ports. The ports are labeled *FC1* and *FC2*, as shown in Figure 1-11.

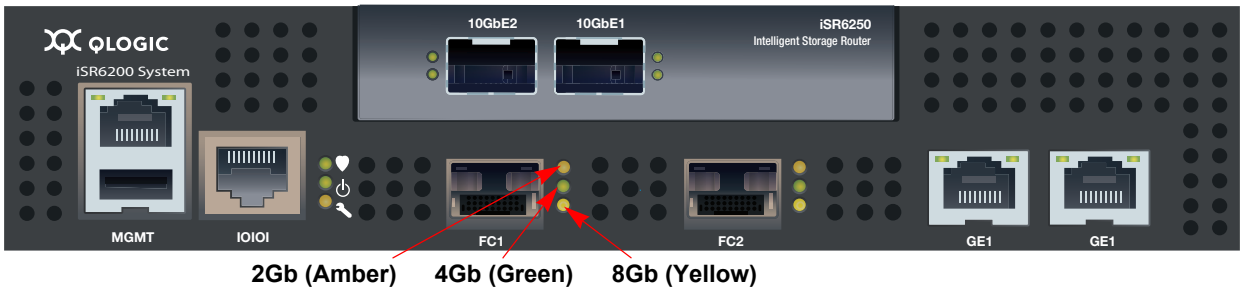


Figure 1-11. Fibre Channel LEDs

The port LEDs are located to the right of their respective ports and provide status and activity information.

Each port has three LEDs:

- The amber (top) LED shows activity for data passing through the port at 2Gbps speed.
- The green LED (middle) shows activity for data passing through the port at 4Gbps speed.
- The yellow LED (bottom) shows activity for data passing through the port at 8Gbps speed.

Table 1-4 describes the port LED blink patterns and their meanings.

Table 1-4. Port LEDs

Activity	Yellow LED (8Gbps)	Green LED (4Gbps)	Amber LED (2Gbps)
Power OFF	OFF	OFF	OFF
Power ON (before firmware initialization)	ON	ON	ON
Power ON (after firmware initialization)	Flashing	Flashing	Flashing
Firmware initialization error[a]	Alternate flashing	Alternate flashing	Alternate flashing
Online, 2Gbps link—I/O activity	OFF	OFF	ON and flashing
Online, 4Gbps link—I/O activity	OFF	ON and flashing	OFF
Online, 8Gbps link—I/O activity	ON and flashing	OFF	OFF
Beacon	Flashing	OFF	Flashing

[a] Yellow, green, and amber LEDs flash alternatively to indicate firmware initialization errors.

Fibre Channel Transceivers

Each port is served by an SFP optical transceiver and is capable of 2, 4, or 8Gbps transmission. SFPs are hot-pluggable. User ports can self-discover both the port type and transmission speed when connected to public devices or switches.

The iSR6200 router supports SFP optical transceivers for the Fibre Channel ports. A transceiver converts electrical signals to and from optical laser signals to transmit and receive data. Duplex fiber optic cables plug into the transceivers, which then connect to the devices. For example, a 2Gbps or 4Gbps Fibre Channel port can transmit at 2Gbps or 4Gbps; however, the transceiver must also be capable of delivering these rates.

The SFP transceivers are hot pluggable. You can remove or install a transceiver while the router is operating without harming the router or the transceiver. However, this interrupts communication with the connected device. For details about installing and removing SFP optical transceivers, see “Installing the Transceivers” on page 3-6.

Gigabit Ethernet Port LEDs

The gigabit Ethernet (GbE) ports shown in Figure 1-12 are RJ45 connectors that provide connection to an Ethernet SAN through a 100 or 1000 Base-T Ethernet cable. The ports are labeled *GE1* and *GE2*. Each of these ports supports connections that run the iSCSI high-level TCP protocol.

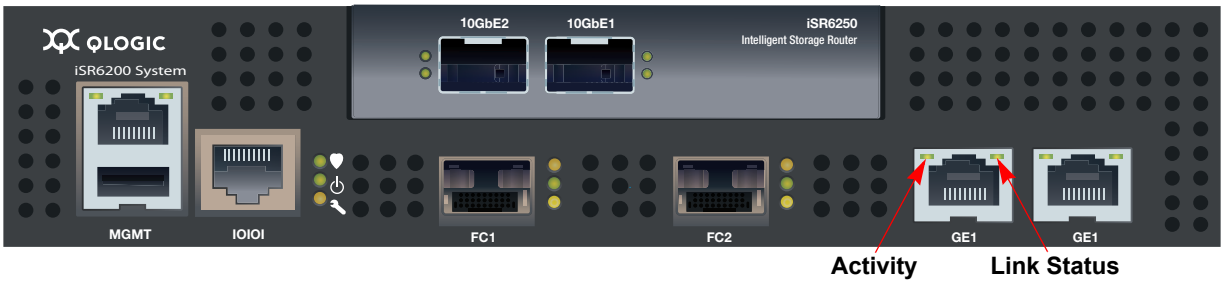


Figure 1-12. Gigabit Ethernet Ports

GbE ports each have two LEDs:

- The activity LED (green) lights up when the port transmits or receives data over the Ethernet connection.
- The link status LED (green) lights up continuously when the port establishes an Ethernet connection.

Ethernet Port—Management

The management Ethernet port shown in Figure 1-13 is an RJ45 connector that provides a connection to a management workstation through a 10 or 100 Base-T Ethernet cable. The port is labeled *MGMT*.

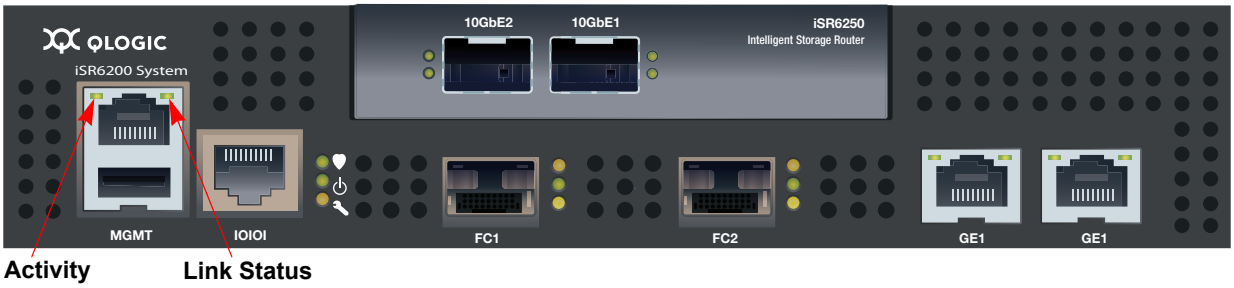


Figure 1-13. Ethernet Management Port

A management workstation can be a Windows®, Solaris®, or a Linux® workstation that configures and manages the router. You can manage the router over an Ethernet connection using either SANsurfer Router Manager, the CLI, or SNMP.

The management Ethernet port has two LEDs:

- The link status LED (green) lights up continuously when the port establishes an Ethernet connection.
- The activity LED (green) lights up when the port transmits or receives data over the Ethernet connection.

Serial Port

The iSR6200 router is equipped with an RS-232 serial port for maintenance purposes. Figure 1-14 shows the serial port location, which is labeled *IOIOI*. You can manage the router through the serial port using the CLI.

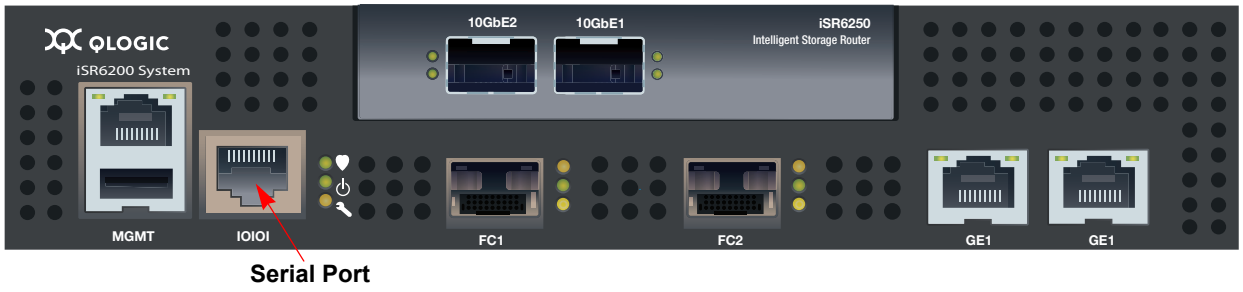


Figure 1-14. Serial Port

The serial port connection requires a standard eight-wire Ethernet cable and the supplied dongle to convert the Ethernet RJ45 connector to a female DB9 connector.

2 Planning

This chapter describes how to plan for the iSR6200 router. The following sections describe the devices and services you need to consider when planning to use the iSR6200 router:

- Devices
- “Device Access” on page 2-2
- “Fibre Channel Switches Required for VPGroups” on page 2-2
- “Fibre Channel Performance” on page 2-2
- “iSCSI Performance” on page 2-3
- “Performance Tuning” on page 2-4
- “Topology” on page 2-7
- “High Availability” on page 2-7
- “Management” on page 2-7
- “Recovery” on page 2-8
- “Services” on page 2-8
- “Security” on page 2-9

Devices

When planning router use, consider the number of devices and the anticipated demand. This determines the number of ports required and, in turn, the number of routers.

The router uses SFP transceivers in the 8Gbps Fibre Channel (FC) ports, but some Fibre Channel devices may not use the same transceivers. Consider whether the Fibre Channel device you want to connect the router to uses SFP or gigabit interface converters (GBIC) transceivers, and choose fibre optic cables accordingly. Use LC-type cable connectors for SFP transceivers and SC-type cable connectors for GBIC transceivers. Also consider the transmission speed compatibility of your devices, adapters, switches, and SFPs.

Device Access

Consider device access needs within the Fibre Channel and iSCSI SANs. Controlling access to Fibre Channel device LUNs requires mapping Fibre Channel device LUNs to specific iSCSI initiators. You may map LUNs to more than one initiator. Giving multiple initiators access to a LUN requires access management.

Fibre Channel

The Fibre Channel ports automatically discover all Fibre Channel target devices, whether connected directly (loop) or by fabric (switch).

iSCSI

The iSCSI ports automatically present targets discovered on the Fibre Channel ports. If the Fibre Channel target's LUN 0 is a controller LUN, it becomes accessible (mapped) to all iSCSI initiators. All data LUNs are inaccessible until mapped. The exception is if LUN 0 is a controller LUN, it is mapped automatically to allow for management of the Fibre Channel target controller.

When an iSCSI initiator logs on, the router records the initiator's iSCSI name and IP address. The management interface—CLI and SANsurfer Router Manager—uses the initiator information to simplify the mapping process.

Fibre Channel Switches Required for VPGroups

iSR6200 uses QLogic Host Bus Adapter technology and is compatible with all Fibre Channel switches from Brocade, Cisco, McData, and QLogic. If you want to use more than one VPGroup, you must use Fibre Channel switches.

Fibre Channel Performance

The iSR6200 router supports Fibre Channel service at transmission rates of 2, 4, or 8 Gbps with a maximum frame size of 2,148 bytes. Related performance characteristics include the following:

- Distance
- Bandwidth
- Latency

Distance

Consider the physical distance between Fibre Channel devices. Choose SFP transceivers that are compatible with the cable type and distance.

Each Fibre Channel port is supported by a data buffer with a three-credit capacity; that is, three maximum-sized frames. For fibre optic cables, this enables full bandwidth over approximately 2.5 kilometers at 2Gbps (1.2 credits/Km).

Beyond these distances, however, the connection loses some efficiency because the transmitting port must wait for an acknowledgement before sending the next frame.

Bandwidth

Bandwidth is a measure of the volume of data that can be transmitted at a specific transmission rate. A 2Gbps Fibre Channel port can transmit or receive at nominal rates of 2Gbps, depending on the device to which it is connected. This corresponds to actual bandwidth value of 212MB.

Latency

Latency is a measure of how fast a transaction travels through the router.

iSCSI Performance

The iSR6200 router supports Ethernet service at transmission rates of 1000Mbps, 100Mbps, or 10Mbps with an MTU size of 1500 or 9000 (jumbo frames).

NOTE

An MTU size greater than 1500 should only be used when the router is connected to a 1000Mbps Ethernet network.

Related performance characteristics include the following:

- Distance
- Bandwidth
- Latency

Distance

Consider the physical distance between routers.This is usually measured in round-trip delay. Round-trip delays range anywhere from less than 1 millisecond to as great as 250 milliseconds.

Bandwidth

Bandwidth is a measure of the volume of data that can be transmitted at a specific transmission rate. WAN data rates range from 1.5 megabits per second (T1) to greater than 600 megabits per second (OC-12).

Latency

Latency is a measure of how fast a transaction travels through the router and LAN or WAN.

Performance Tuning

Proper configuration maximizes the router's performance. Knowing the round-trip delay (distance between the router and iSCSI initiators) and WAN effective data rate (connection type) allows you to tune the router for optimal performance. The following tables provide **TCP Window Size** settings for specific WAN environments. The **TCP Window Size** is configured as two parameters: **Window Size** and **Scaling Factor**. See the *iSR6200 Router Manager User's Guide* and the *iSR6200 Command Line Interface (CLI) User's Guide* for configuring the TCP window size.

Table 2-1. T1—1.554Mbps

Round-Trip Delay (ms)	TCP Window Size (kBytes)
≤ 41.5	8
≤ 82.9	16
≤ 165.8	32
≤ 331.6	64
≤ 663.2	128
≤ 1326.5	256
≤ 2652.9	512

Table 2-2. T3—45Mbps

Round-Trip Delay (ms)	TCP Window Size (kbytes)
≤ 1.4	8
≤ 2.9	16
≤ 5.7	32
≤ 11.4	64
≤ 22.9	128
≤ 45.8	256
≤ 91.6	512
≤ 183.1	1024
≤ 366.2	2048 [a]
≤ 732.5	4096 [a]

Table Notes

[a] Supported in FC-IP mode only.

Table 2-3. OC-1—51Mbps

Round-Trip Delay (ms)	TCP Window Size (kbytes)
≤ 1.2	8
≤ 2.5	16
≤ 4.9	32
≤ 9.9	64
≤ 19.8	128
≤ 39.5	256
≤ 79.0	512
≤ 158.0	1024
≤ 316.1	2048 [a]
≤ 632.1	4096 [a]

Table Notes

[a] Supported in FC-IP mode only.

Table 2-4. OC-3—156Mbps

Round-Trip Delay (ms)	TCP Window Size (bytes)
≤ 0.4	8
≤ 0.8	16
≤ 1.6	32
≤ 3.3	64
≤ 6.6	128
≤ 13.2	256
≤ 26.3	512
≤ 52.7	1024
≤ 105.4	2048
≤ 210.7	4096

Table 2-5. OC-12—621Mbps

Round-Trip Delay (ms)	TCP Window Size (bytes)
≤ 0.1	8
≤ 0.2	16
≤ 0.4	32
≤ 0.8	64
≤ 1.6	128
≤ 3.3	256
≤ 6.6	512
≤ 13.2	1024
≤ 26.3	2048
≤ 52.7	4096

Topology

The iSR6200 router supports interconnecting remote SANs (see Figure 2-1).

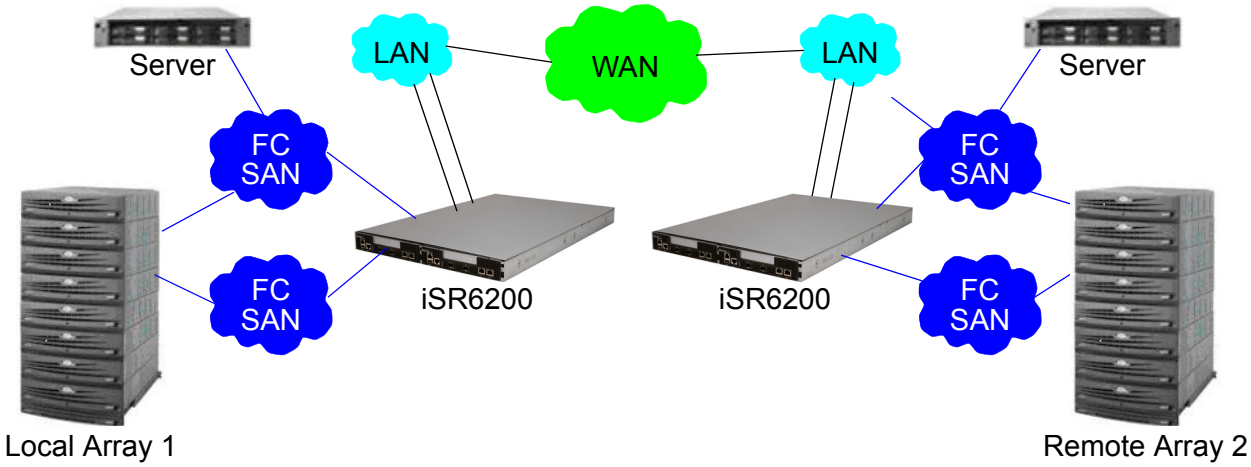


Figure 2-1. WAN Topology—Remote SAN Interconnect

High Availability

A dual-blade iSR6200 router supports high availability, which provides link-level, switch-level, and blade-level failure protection. To make this effective, you must connect the iSCSI hosts to both iSR6200 blades. For details, see “Connecting iSCSI Hosts to the iSR6200” on page 4-16.

Management

SANsurfer Router Manager and the CLI run on a management workstation used to configure, control, and maintain the router. Support platforms include Windows, Solaris, and Linux. The SANsurfer Router Manager utility is installed and executed on the workstation.

The router supports the following management interfaces:

- **SANsurfer Router Manager** is a graphical user interface (GUI) utility that runs on a management workstation (see the *iSR6200 Router Manager User’s Guide*).
- **CLI** is the command line interface that runs on the router; users can access the CLI by means of Telnet or the serial port (see the *iSR6200 Command Line Interface (CLI) User’s Guide*).
- **SNMP** provides router status, traps, and alerts (for details, see Appendix B).

Recovery

You should have a process in place to recover from a possible router failure. Consider the following when developing a recovery process for the router:

- Save all firmware image files (updates) in a safe, well-known place, because you may:
  - ❑ Want to revert to a previous firmware version
  - ❑ Need the firmware image when replacing a single-blade router
  - ❑ Need the firmware image when adding a router to your site
- Save the router's configuration (as a new file) after every configuration change, because you may:
  - ❑ Want to revert to a previous configuration
  - ❑ Need to configure a replacement blade in a single-blade router
- Save the router's LUN mappings (as a new file) after every mapping change, because you may:
  - ❑ Want to revert to a previous LUN mapping
  - ❑ Need to LUN-map a replacement blade in a single-blade router
  - ❑ Want to duplicate the LUN mapping on a second router (for redundancy)

NOTE

For more details on recovering a router blade, see "iSR6200 Chassis Blades" on page 7-1.

Services

You can configure your router to suit the demands of your environment using a variety of router services. Familiarize yourself with the following router services and determine which ones you need:

- **Telnet** enables you to manage the router over a Telnet connection.
- **Router management** provides for out-of-band management of the router with SANsurfer Router Manager.
- **SNMP** enables you to monitor the router using third-party applications that use SNMP.
- **Network time protocol (NTP)** enables you to synchronize the router and the workstation dates and times with an NTP server. NTP is disabled (not configured) by default.

- **File transfer protocol (FTP)** enables you to transfer files rapidly between the workstation and router using FTP.
- **Secure SHell (SSH)** provides secure and encrypted connections to traditionally non-encrypted services.

Security

Passwords provide router security. SANsurfer Router Manager requires a password each time a user logs into the utility. After you are connected, SANsurfer Router Manager prompts for an administrative password before it accepts configuration changes.

The CLI also requires the user to enter a user ID and password to start. The CLI must be in an admin session to perform any set operations. An admin session requires a password.

The default password for both these management utilities is *password* for the default user ID of *guest*. The default administrative password is *config*.

After you have logged on, you can change the password using the utility's security features.

3 Installation

This chapter describes how to install and configure an iSR6200 router, including:

- "Site Requirements" on page 3-1
- "Installing the iSR6200 Router" on page 3-2
- "Installing New Firmware" on page 3-15

Site Requirements

The following sections describe the requirements for installing an iSR6200 router:

- Management Workstation
- "Power Requirements" on page 3-2
- "Environmental Conditions" on page 3-2

Management Workstation

Table 3-1 lists the requirements for the management workstation running SANsurfer Router Manager.

Table 3-1. Management Workstation Requirements

Item	Description
Operating system	One of the following: ■ Windows 2000, 2003 ■ Solaris 8, 9, 10 ■ Linux Red Hat® Enterprise Linux 3.x ■ SUSE® Linux 9.0 Enterprise ■ Mac OS® X 10.3
Memory	256MB or more
Disk space	150MB per installation
Processor	500MHz or faster
Hardware	CD-ROM drive, RJ45 Ethernet port, RS-232 serial port (optional)

Table 3-1. Management Workstation Requirements (Continued)

Item	Description
Internet browser	One of the following: ■ Microsoft Internet Explorer 5.0 and later ■ Mozilla® Firefox® 1.02 and later ■ Java™ 2 runtime environment to support the Web applet

Power Requirements

The iSR6200 router requires the following power supply:

- 235W maximum, 200W typical
- 100V AC to 240V AC; 50Hz to 60Hz
- 1.9A at 100–125V AC; 1.02A at 200–240V AC

Environmental Conditions

Consider the factors that affect the climate in your facility, such as equipment heat dissipation and ventilation. The router requires the following operating conditions:

- Operating temperature range: 5–40°C (41–104°F).
- Relative humidity: 15–80 percent, non-condensing.

Installing the iSR6200 Router

Unpack the router, accessories, and documentation. The iSR6200 router is shipped with the following components:

- iSR6200 router chassis with two blades installed
- DB9 to RJ45 cable adapter
- Power cable (6 foot black)
- Rail Mounting Kit, part number 50990-00
- *WEEE Conformance Card*
- *QLogic Global Services Card*
- *China Optics and Cable SKUs Toxic Substance Table*

To install the iSR6200 router:

1. Complete the pre-installation checklist (see page 3-3).
2. Mount the router (see page 3-5).
3. Install the transceivers (see page 3-6).
4. Connect the router to AC power (see page 3-7).

5. Connect the management workstation to the router (see page 3-8).
6. Configure the management workstation (see page 3-9).
7. Install the management utility (see page 3-11).
8. Start the management utility (see page 3-14).
9. Configure the router (see page 3-14).
10. Cable devices to the router (Fibre Channel and iSCSI) (see page 3-15).

Pre-installation Check List

During the initial configuration process, the system prompts you to enter information for each blade contained in the iSR6200 chassis. Use the space provided in the following tables to record the IP addresses for each blade.

Table 3-2. Worksheet for Router Blade 1 (left) Parameters

Symbolic Name of the iSR6200 Blade 1	
Management port IP address, subnet mask, and gateway (if not using DHCP)	
iSCSI port 1 IP address, subnet mask, and gateway (GE-1)	
IP address of the iSNS server for iSCSI port 1 (if iSNS will be enabled)	
iSCSI port 2 IP address, subnet mask, and gateway (GE-2)	
IP address of the iSNS server for iSCSI port 2 (if iSNS will be enabled)	
iSCSI port 3 IP address, subnet mask, and gateway for the optional (FC3, GE-3, or 10GE-3) port	
IP address of the iSNS server for iSCSI port 3 (if iSNS will be enabled)	

Table 3-2. Worksheet for Router Blade 1 (left) Parameters (Continued)

iSCSI port 4 IP address, subnet mask, and gateway for the optional (FC4, GE-4, or 10GE-4) port	
IP address of the iSNS server for iSCSI port 4 (if iSNS will be enabled)	

Table 3-3. Worksheet for Router Blade 2 (right) Parameters

Symbolic Name of the iSR6200 Blade 2	
Management port IP address, subnet mask, and gateway (if not using DHCP)	
iSCSI port 1 IP address, subnet mask, and gateway (GE-1)	
IP address of the iSNS server for iSCSI port 1 (if iSNS will be enabled)	
iSCSI port 2 IP address, subnet mask, and gateway (GE-2)	
IP address of the iSNS server for iSCSI port 2 (if iSNS will be enabled)	
iSCSI port 3 IP address, subnet mask, and gateway for the optional (FC3, GE-3, or 10GE-3) port	
IP address of the iSNS server for iSCSI port 3 (if iSNS will be enabled)	
iSCSI port 4 IP address, subnet mask, and gateway for the optional (FC4, GE-4, or 10GE-4) port	

Table 3-3. Worksheet for Router Blade 2 (right) Parameters (Continued)

IP address of the iSNS server for iSCSI port 4 (if iSNS will be enabled)	

Mounting the Router

You can either place the router on a flat surface or mount it in a 19-inch Electronic Industries Alliance (EIA) rack. See the product specification for weight and dimensions. Rack mounting requires a QLogic rack mounting kit; contact QLogic for more information.

⚠WARNING

Mount routers in the rack so that the weight is distributed evenly. An unevenly loaded rack can become unstable, possibly resulting in equipment damage or personal injury.

AVERTISSEMENT

Installer les routeurs dans l’armoire informatique de sorte que le poids soit réparti uniformément. Une armoire informatique déséquilibré risque d'entraîner des blessures ou d'endommager l'équipement.

WARNUNG

Bauen Sie die Router so in das Rack ein, dass das Gewicht gleichmäßig verteilt ist. Ein Rack mit ungleichmäßiger Gewichtsverteilung kann schwanken/umfallen und Gerätbeschädigung oder Verletzung verursachen.

ADVERTENCIA

Monte los enrutadores en el estante de modo que el peso se distribuya de manera uniforme. Un estante cuya carga no esté distribuida de manera uniforme puede ser inestable y podría dañar el equipo o causar lesiones personales.

CAUTION

- If the router is mounted in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the chassis in an environment that is compatible with the maximum rated ambient temperature.
- Do not restrict chassis air flow. Allow 16cm (6.5 inches) minimum clearance at the front and rear of the router (surface mount) or rack for service access and ventilation.
- Multiple rack-mounted units connected to the AC supply circuit may overload that circuit or overload the AC supply wiring. Consider the power source capacity and the total power usage of all routers on the circuit.
- Reliable grounding in the rack must be maintained from the router chassis to the AC power source.

Installing the Transceivers

The router supports a variety of SFP transceivers.

CAUTION

Ensure that you insert the 8Gb or 10Gb SFP transceiver into the correct port. These transceiver types are not interchangeable.

- To install a transceiver, insert the transceiver into the port, and then gently press until it snaps in place.
- To remove a transceiver, gently press the transceiver into the port to release tension, pull the release tab or lever, and then remove the transceiver. Different transceiver manufacturers have different release mechanisms. Consult the documentation for your transceiver.

NOTE

The transceiver fits only one way. If the transceiver does not install under gentle pressure, flip it over and try again.

Connecting the Router to AC Power

⚠WARNING

This product is supplied with a three-wire power cable and plug for the user's safety. Use this power cable in conjunction with a properly grounded outlet to avoid electrical shock. An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the router chassis. The customer must make sure the outlet is correctly wired and grounded to prevent electrical shock.

You may require a different power cable in some countries because the plug on the cable supplied with the equipment will not fit your electrical outlet. In this case, you must supply your own power cable. The cable must meet the following requirements:

- For 125 volt electrical service: the cable must be rated at 10 amperes and be approved by UL and CSA.
- For 250 volt electrical service: the cable must be rated at 10 amperes, meet requirements of H05VV-F, and be approved by VDE, SEMKO, and DEMKO.

Figure 3-1 shows the front and back plates of an iSR6200 router chassis that contains two router blades with add-in ports installed for its model. Each PCM provides a power connector, as well as a Status LED.

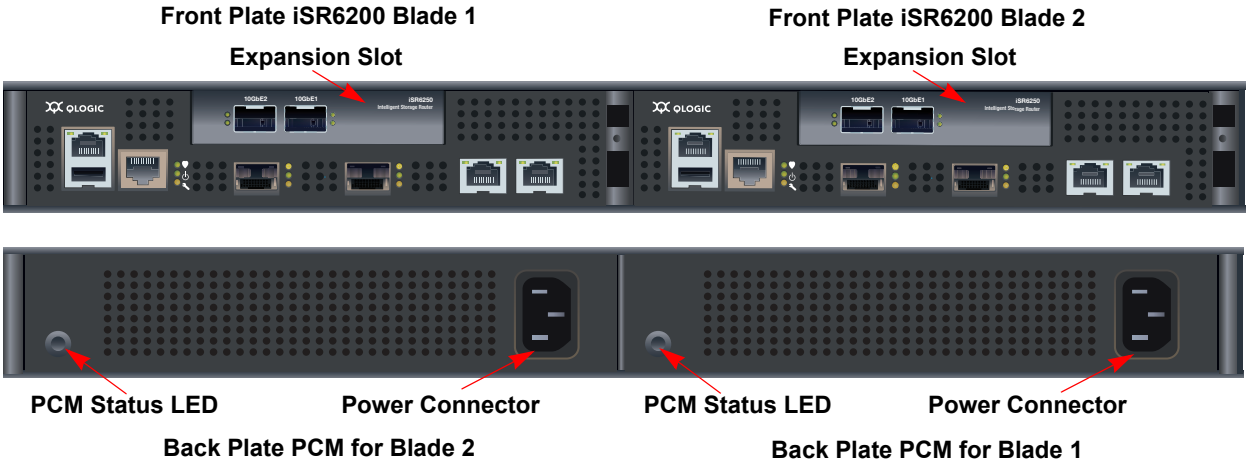


Figure 3-1. iSR6200 Router Chassis—Front and Back Plates

Refer to Figure 3-1 to locate the power connector and PCM status LED for the blade you are configuring.

To power on the router:

1. Attach the AC power cord to the power connector, located on the back side of the PCM connected directly behind the router blade.
2. Connect the opposite end of the power cord to a grounded AC wall outlet or power strip.
3. Check the PCM power LED to make sure the fan is operational (green = OK, yellow = no AC power).

   Figure 3-2 shows the location of the ports and LEDs on one of the blades contained within the iSR6200 unit that are referenced in the following instructions.

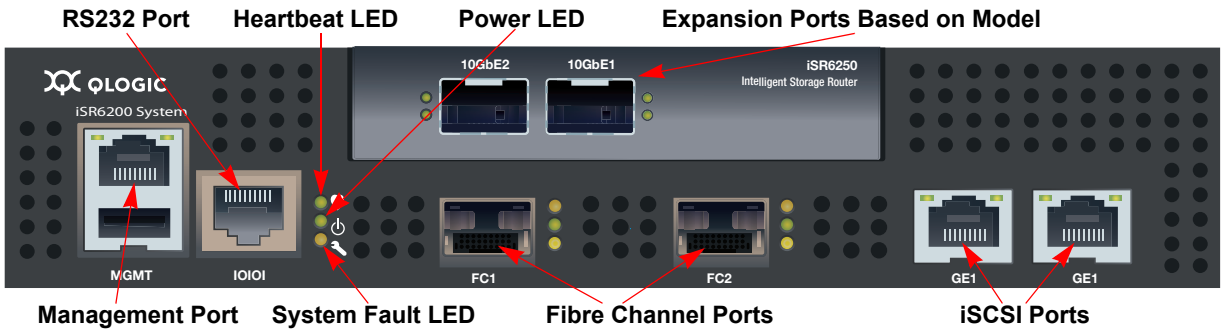


Figure 3-2. iSR6200 Blade Ports and LEDs

4. Verify that the router's input power LED is illuminated.

   The iSR6200 router runs its self test and begins normal operation—this may take a minute.

5. Verify that the heartbeat LED is blinking (once per second) and that the system fault LED is not illuminated.

If an error has occurred, the system fault LED blinks a pattern that indicates the fault reason. For more information about error blink patterns, see page 6-2.

Connecting the Management Workstation to the Router

You can manage the router using either SANsurfer Router Manager or the CLI. SANsurfer Router Manager requires an Ethernet connection to the router. The CLI can use either an Ethernet connection or a serial connection. Choose the router management method, and then connect the management workstation to the router in one of the following ways:

- **Indirect Ethernet connection** from the management workstation to the router RJ45 connector through an Ethernet switch or hub. This requires a 10 or 100 Base-T straight cable.

- **Direct Ethernet connection** from the management workstation to the router RJ45 Ethernet connector. This requires a 10 or 100 Base-T crossover cable.
- **Serial port connection** from the management workstation to the router RS-232 serial port connector. This requires a 10 or 100 Base-T straight cable and a dongle.

Configuring the Management Workstation

The router comes from the factory with a default IP address (10.0.0.1). Prior to product installation, follow the procedures included in this section based on your configuration method:

- If you plan to configure the router through the management Ethernet port (using either SANsurfer Router Manager or the CLI through Telnet), you must initially configure the workstation as described in "Setting the Workstation IP Address" on page 3-9.
- If you plan to configure the router using the management COM port, configure the workstation as described in "Configuring the Workstation Serial Port" on page 3-10.

Setting the Workstation IP Address

The IP address of a new router is `10.0.0.1`. To ensure that your workstation is configured to communicate with the `10.0.0` subnet, refer to the following instructions for your workstation:

- Steps for different versions of Windows vary. For a Windows 2000 workstation, follow these steps:
  a. On the Windows **Start** menu, point to **Settings**, point to **Control Panel**, and then click **Network and Dial-up Connections**.
  b. Click **Make New Connection**.
  c. Click **Connect to a private network through the Internet**, and then click **Next**.
  d. Enter `10.0.0.253` for the IP address.
- For other versions of Windows, consult the Windows Help files.
- For Linux or Solaris workstation, open a command window and enter the following command, where *<interface>* is your interface name:

```
ifconfig <interface> ipaddress 10.0.0.253 netmask
255.255.255.0 up
```

Configuring the Workstation Serial Port

To configure the workstation serial port:

1. Connect the cable with an RJ45 to DB9F adapter from a COM port on the management workstation to the serial port on the router.
2. Configure the workstation serial port according to your platform. These steps may vary according to the operating system version you use:

   ❑ **For Windows:**

   a. Open the HyperTerminal application: On the Windows **Start** menu, click **Programs**, point to **Accessories**, point to **Communications**, and then click **HyperTerminal**.

   b. Enter a name for the router connection, choose an icon in the Connection Description window, and then click **OK**.

   c. In the COM Properties window, type the following **COM Port** settings, and then click **OK**.

   Bits per second—115200
   Data Bits—8
   Parity—None
   Stop Bits—1
   Flow Control—None

   ❑ **For Linux:**

   a. Set up minicom to use the serial port. Create or modify the `/etc/minirc.dfl` file with the following content:

   ```
   pr portdev/ttyS0
   pu minit
   pu mreset
   pu mhangup
   ```

   Where `pr portdev/ttyS0` specifies port 0 on the workstation. Select the `pr` setting to match the workstation port to which you connected the router.

   b. Verify that all users have permission to run minicom. Review the `/etc/minicom.users` file and confirm that the line ALL exists or that there are specific user entries.

   ❑ **For Solaris:**

   ■ Modify the `/etc/remote` file to include the following line:

   ```
   \:dv=/dev/term/a:br#115200:el=^C^S^Q^U^D:ie=%$:oe=^D
   :
   ```

Where `/dev/term/a` refers to serial port `a`. Choose the `dv` setting to match the workstation port to which you connected the router.

3. Connect the router to the power (see page 3-14).

Installing SANsurfer Router Manager

You can manage the router using SANsurfer Router Manager. The following sections describe how to download this utility from the QLogic Web site and install it on a Windows, Linux, or Mac OS X workstation. For information on how to use SANsurfer Router Manager, see the *iSR6200 Router Manager User's Guide*.

Downloading the SANsurfer Router Manager Installer

1. Go to the QLogic Downloads and Documentation page located here:

   http://driverdownloads.qlogic.com

2. Under **QLogic Products**, click the **Guided Search** link.
3. Complete the Search Support dialog box as follows:
   a. In the **Select a Product Type** box, click **Routers**.

      The **Select by Model or OS** box defaults to **By Model**.

   b. In the **Select the Product Technology** box, click **Intelligent Storage Routers**.
   c. In the **Select the Model** box, click the router model number.
   d. In the **Select the Desired Item** box, click **Management Tools**.
   e. Click **Search**.

Figure 3-3 shows an example of the Search Support dialog box in Windows Internet Explorer.

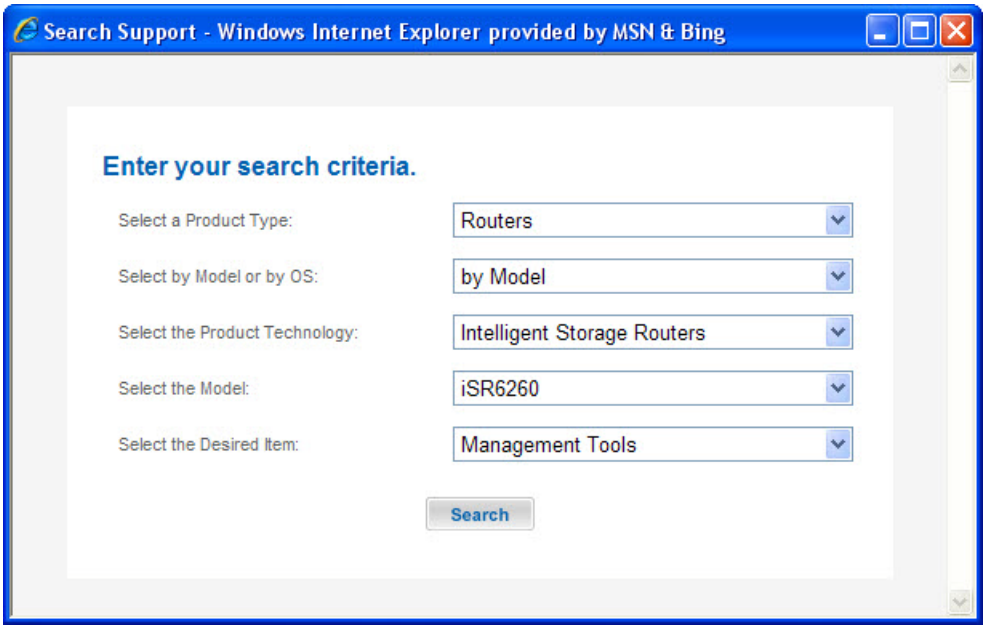


Figure 3-3. Search Support Dialog Box (Example)

The Downloads page lists the search results; Figure 3-4 shows an example.

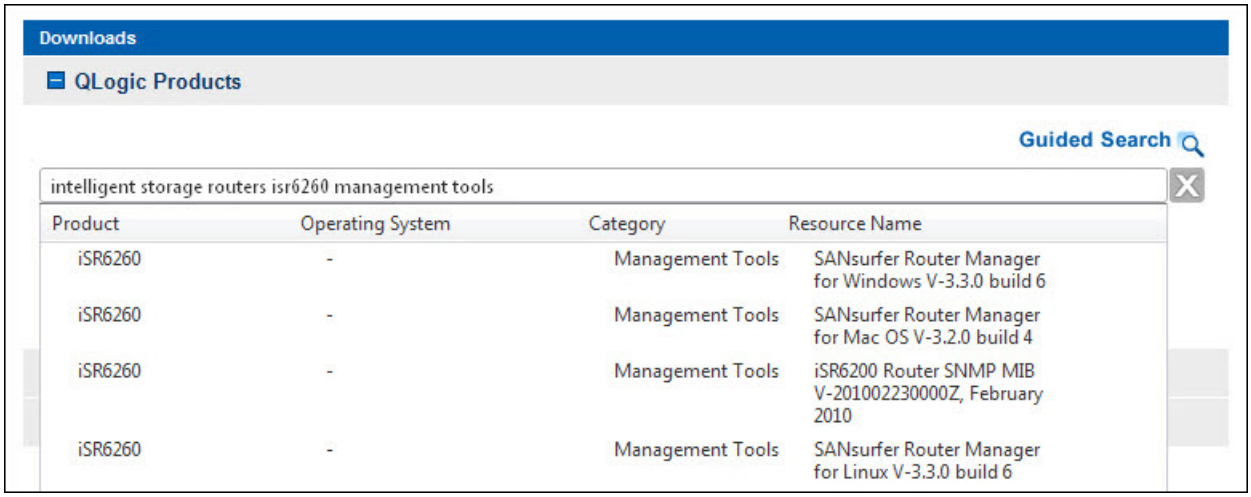


Figure 3-4. Guided Search Results

4. Under **Resource Name**, click the **SANsurfer Router Manager for *<operating system>* *<version>*** that you want to install.

5. Under **SANsurfer Router Manager for <*operating system*>**, click the **Download** link.
6. On the File Download dialog box, click **Save**.
7. On the Save As dialog box, specify a location on your local machine to store the installation file, and then click **Save**.

   The installer shows the download progress.
8. Continue with the steps for your operating system, either:
   - Windows Installation
   - Linux Installation
   - Mac OS X Installation

Windows Installation

To install SANsurfer Router Manager on a Windows PC workstation:

1. Follow the download instructions in “Downloading the SANsurfer Router Manager Installer” on page 3-11.
2. Close all programs that are currently running.
3. On the Download Complete dialog box, click **Run**.
4. If your Internet browser displays a security warning, you can safely bypass the warning.
5. Follow the prompts in the SANsurfer iSCSI-FC Router Manager installation wizard.

Linux Installation

To install SANsurfer Router Manager on a Linux workstation:

1. Follow the download instructions in “Downloading the SANsurfer Router Manager Installer” on page 3-11.
2. On the Download Complete dialog box, click **Open**.
3. Double-click the `.bin` file to start the installation wizard.
4. Follow the prompts in the SANsurfer iSCSI-FC Router Manager installation wizard.

Mac OS X Installation

To install SANsurfer Router Manager on a Mac OS X workstation:

1. Follow the download instructions in “Downloading the SANsurfer Router Manager Installer” on page 3-11.
2. On the Download Complete dialog box, click **Open**.

3. Double-click the **`install.app`** icon to start the installation wizard.
4. Follow the prompts in the SANsurfer iSCSI-FC Router Manager installation wizard.

Starting SANsurfer Router Manager

To start SANsurfer Router Manager, use the applicable method:

- For Windows, either double-click the SANsurfer Router Manager desktop shortcut, or click **Start**, point to **All Programs**, point to **QLogic Management Suite**, and then click **SANsurfer Router Manager**, depending on how you installed the SANsurfer Router Manager utility.
- From a Windows command line, issue the following command:

  *<install_directory>***SANsurferRouterManager.exe**

- From a Linux command prompt, issue the following command:

  *<install_directory>***./SANsurferRouterManager**

Configuring the Router

You can configure the router using either SANsurfer Router Manager or the CLI.

In SANsurfer Router Manager, configure router ports by selecting a Fibre Channel or iSCSI port in the left pane (tree pane), and then completing the Information and Advanced Configuration pages for that port in the right pane. For details, see the *iSR6200 Router Manager User's Guide*, "FC Ports" and "iSCSI Ports" sections.

To configure the router using the command line interface:

1. Open a command window according to the type of workstation and connection:
   - **Ethernet** (all platforms): Open a Telnet session with the default router IP address and log into the router with the default account name (`guest`) and password (`password`):

     ```
     telnet 10.0.0.1
     username: guest
     password: ********
     ```

   - **Serial, Windows**: Open the HyperTerminal application on a Windows platform as follows:
     a. From the Windows **Start** menu, click **Programs**, point to **Accessories**, point to **Communications**, and then click **HyperTerminal**.
     b. Select the connection you created earlier, and then click **OK**.

- ❑ **Serial**, **Linux**: Open a command window and enter the following command:

  minicom

2. Open an admin session, select a blade (1 or 2), and then enter the commands to set up both iSCSI ports and the management interface. (See the *iSR6200 Command Line Interface (CLI) User's Guide* for command descriptions.)

```
iSR6200 #> admin start
Password :  ******
iSR6200 (admin) #> set mgmt
.....
iSR6200 (admin) #> set iscsi 1
.....
iSR6200 (admin) #> set iscsi 2
.....
```

Connecting Cable Devices to the Router

Connect cables to the SFP transceivers and their corresponding devices. Devices can have SFP (or small form factor, SFF) transceivers or GBICs. Choose the fiber optic cable with the connector combination that matches the device being connected to the router:

- LC-type duplex fiber optic cable connectors are designed for SFP transceivers.
- SC-type connectors are designed for GBICs.
- OM-3 connectors are designed for 10Gb ports.

Installing New Firmware

The router comes with the current firmware installed. You can upgrade the firmware from the management workstation when new firmware becomes available.

To locate and download new firmware:

1. Go to the QLogic Downloads and Documentation page located here:

   http://driverdownloads.qlogic.com

2. Under **QLogic Products**, type `router firmware` in the search box.

   (Alternatively, you can click the **Guided Search** link to obtain assistance in locating the firmware to download.)

3. In the results box under **Resource Name**, click the router firmware that you want to install, and then download the file.

You can use either SANsurfer Router Manager or the CLI to install new firmware, as shown in the following sections.

NOTE

Installing new firmware disrupts the router blade connectivity because you must reboot the router blade to activate the new firmware.

Using SANsurfer Router Manager to Install Firmware

SANsurfer Router Manager provides the FW Update Wizard with the steps required to update the iSR6200 firmware on selected iSR6200 router blades.

To install firmware using SANsurfer Router Manager:

1. On the **File** menu, click **FW Update Wizard**.
2. On the Router Selection dialog box, click the router blade to update its firmware, and then click **Next**.
3. On the Firmware File Selection dialog box, locate and select the firmware image file, and then click **Next**.
4. On the Confirm Changes dialog box, review the firmware status, and then click **Next** to confirm the changes.
5. On the Firmware Update Status dialog box, respond to the message prompts, and then click **Next**.
6. On the final dialog box, reboot to finish the firmware update.

Using the CLI to Install Firmware

To use the CLI to install the firmware, transfer the firmware image file from a workstation to the router. Then use the CLI `image unpack` command to install the new firmware image.

To install firmware in the CLI:

1. At the workstation prompt, use the `ftp` command to go to the location on the router where you want to transfer the firmware image. For example:

```
C:\fwImage>ftp 172.17.137.190
Connected to 172.17.137.190.
220 (none) FTP server (GNU inetutils 1.4.2) ready.
```

2. Enter your user name and password. For example:

```
User (172.17.137.190:(none)): ftp
331 Guest login ok, type your name as password.
Password: ftp
230 Guest login ok, access restrictions apply.
```

3. At the `ftp` prompt, type **`bin`** to set binary mode. For example:

```
ftp> bin
200 Type set to I.
```

4. Use the `put` command to transfer the firmware image file from the workstation to the router. For example:

```
ftp> put isr-6200-3_0_0_5.bin
200 PORT command successful.
150 Opening BINARY mode data connection for
'isr-6200-3_0_0_5.bin'.
226 Transfer complete.
ftp: 4822816 bytes sent in 0.41Seconds 11878.86Kbytes/sec.
```

5. Enter **`quit`**.

   The firmware image has been transferred to the router.

6. At a Telnet prompt, log on to the router as an administrator.
7. Select one of the blades.
8. Enter the following command from the router, where `x` indicates the firmware image name:

   `image unpack isr-62xx-x_x_x_x.bin`

   The following message appears:

```
Unpack Completed. Please reboot the system for FW to take
effect.
```

9. Enter **`reboot`**.

   The following message appears:

```
Are you sure you want to reboot the System (y/n):
```

10. To reboot the system, type **`y`**.
11. If a second blade is installed, repeat this procedure.

4 Configuration

This chapter describes how to configure the iSR6200 router to support virtual port groups (VPGroups or VPGs) and LUN mapping.

Some storage arrays limit the number of LUNs exposed to a host to 256 LUNs. Each iSR6200 router blade supports up to four VPGs, making it possible for these storage arrays to present up to 1,024 LUNs per blade.

When configuring VPGs on the iSR6200 router, follow these guidelines:

- All Fibre Channel (FC) virtual ports from a single VPG must be part of only one logical host on the storage array.
- Fibre Channel ports from different VPGs must not be part of the same logical host on the storage array.
- A specific LUN can be presented to one and only one VPG. It can be presented to other Fibre Channel hosts, but only one VPG on a specific iSR6200 router (chassis).

The following sections describe how to configure VPGs and the Fibre Channel arrays connected to them:

- “Enabling Virtual Port Groups” on page 4-2
- “Zoning Virtual Port Groups on the SAN” on page 4-9
- “Configuring Fibre Channel Array Hosts and LUN Assignments” on page 4-12
- “Connecting iSCSI Hosts to the iSR6200” on page 4-16
- “Controlling per-Host LUN Access on the iSR6200” on page 4-23

Enabling Virtual Port Groups

Each iSR6250 router blade has one virtual port group (VPG) enabled by default, which gives iSCSI hosts access to 256 LUNs. You can enable and configure additional VPGs to give iSCSI hosts access to more than 256 distinct LUNS from a specific Fibre Channel target array.

Each blade has VPG 1 enabled by default; VPG 1 is the primary virtual port group and cannot be disabled. Enabling additional virtual port groups creates additional logical Fibre Channel adapter initiator ports on the fabric. These ports act as separate Fibre Channel adapter host ports, and additional 256 LUNs can be presented to each of them. With all four VPGs enabled, a single iSR6250 blade can access up to1,024 LUNs from a single target world wide port number (WWPN).

You can view Virtual Port Group information using the `show vpgroups` command in the CLI, as shown in the following example.

```
iSR6200 <1> (admin) #> show vpgroups

  VpGroup Information
  ---------------------
  Index                    1
  VpGroup Name             VPGROUP_1
  Status                   Enabled
  WWPNs                    21:00:00:c0:dd:13:16:f8
                           21:00:00:c0:dd:13:16:f9

  Index                    2
  VpGroup Name             VPGROUP_2
  Status                   Disabled
  WWPNs                    N/A

  Index                    3
  VpGroup Name             VPGROUP_3
  Status                   Disabled
  WWPNs                    N/A

  Index                    4
  VpGroup Name             VPGROUP_4
  Status                   Disabled
  WWPNs                    N/A
```

Using SANsurfer Router Manager, select one of the VP Group nodes in the left pane to view that VP Group's information in the right pane, as shown in Figure 4-1.

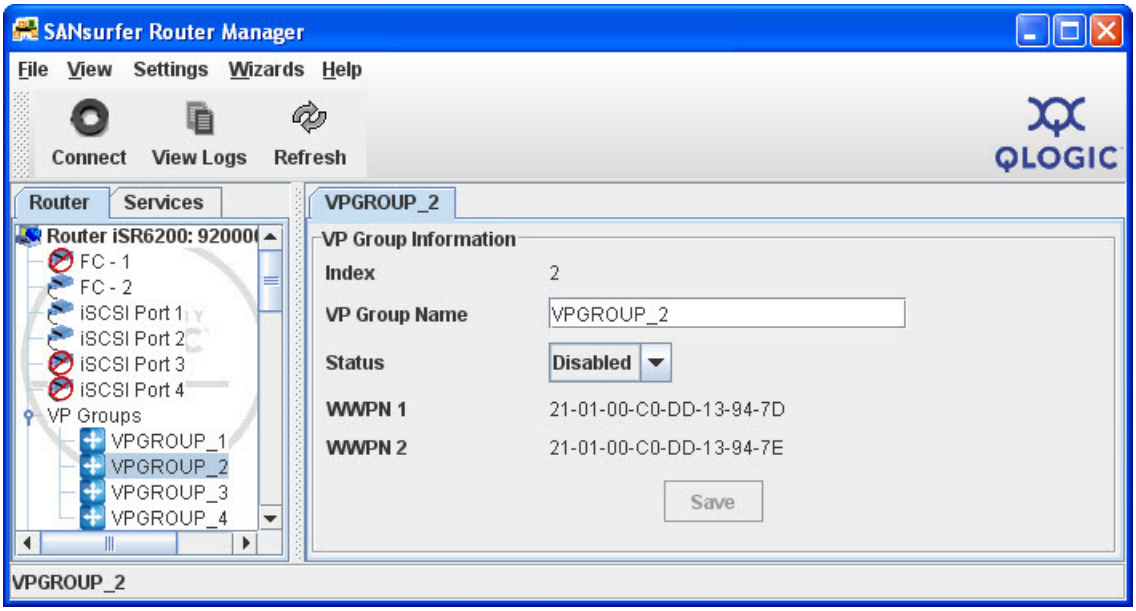


Figure 4-1. SANsurfer Router Manager VPGroup

You can enable or disable virtual port groups on your blade using either SANsurfer Router Manager or the CLI.

To enable or disable a VPGroup using SANsurfer Router Manager:

1. In the system tree pane on the left, click the VP Group.

   The right panel shows information about the selected VP Group.

2. In the **Status** list, select **Enabled** or **Disabled** (see Figure 4-2).

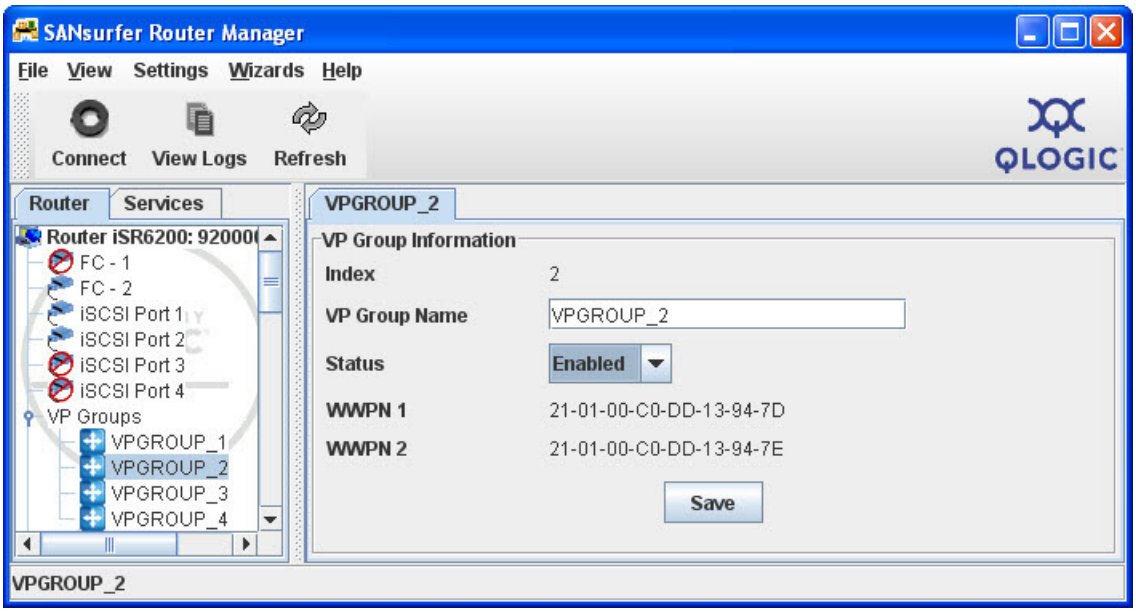


Figure 4-2. Chassis Information for Selected VPGROUP

3. Click **Save**.
4. In the System Check dialog box, type the system password, and then click **OK**.

   The Set VPGroup message box opens, as shown in Figure 4-3.

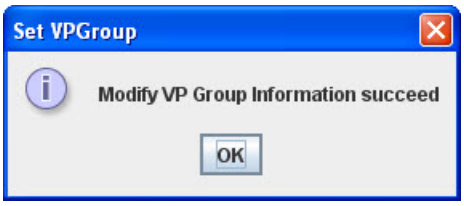


Figure 4-3. Set VPGroup Message Box

5. Click **OK** to close the message box.

To enable or disable a VPGroup using the CLI:

The following example shows how to enable VPGroups 2 and 3 by issuing the CLI `set vpgroups` command.

```
iSR6200 <1> (admin) #> set vpgroups

  The following wizard will query for attributes before persisting
  and activating the updated mapping in the system configuration.
  If you wish to terminate this wizard before reaching the end of the list
  press 'q' or 'Q' and the ENTER key to do so.

  Configuring VpGroup: 1
  ------------------------
  Status (0=Enable, 1=Disable)               [Enabled     ]
  VpGroup Name (Max = 64 characters)         [VPGROUP_1   ]

  All attribute values for VpGroup 1 that have been changed will now be saved.

  Configuring VpGroup: 2
  ------------------------
  Status (0=Enable, 1=Disable)               [Disabled    ] 0
  VpGroup Name (Max = 64 characters)         [VPGROUP_2   ]

  All attribute values for VpGroup 2 that have been changed will now be saved.

  Configuring VpGroup: 3
  ------------------------
  Status (0=Enable, 1=Disable)               [Disabled    ] 0
  VpGroup Name (Max = 64 characters)         [VPGROUP_3   ]

  All attribute values for VpGroup 3 that have been changed will now be saved.

  Configuring VpGroup: 4
  ------------------------
  Status (0=Enable, 1=Disable)               [Disabled    ]

  All attribute values for VpGroup 4 that have been changed will now be saved.
```

The following example shows CLI command output using an iSR6200 blade with three virtual port groups enabled. You can view information about the virtual port groups configured on your iSR6200 by issuing the `show vpgroups` command.

```
iSR6200 <1> (admin) #> show vpgroups

  VpGroup Information
  ---------------------
  Index                    1
  VpGroup Name             VPGROUP_1
  Status                   Enabled
  WWPNs                    21:00:00:c0:dd:13:16:f8
                           21:00:00:c0:dd:13:16:f9

  Index                    2
  VpGroup Name             VPGROUP_2
  Status                   Enabled
  WWPNs                    21:01:00:c0:dd:13:16:f8
                           21:01:00:c0:dd:13:16:f9

  Index                    3
  VpGroup Name             VPGROUP_3
  Status                   Enabled
  WWPNs                    21:02:00:c0:dd:13:16:f8
                           21:02:00:c0:dd:13:16:f9

  Index                    4
  VpGroup Name             VPGROUP_4
  Status                   Disabled
  WWPNs                    N/A
```

In the preceding examples, the second byte from the left (in **bold** text) denotes the virtual port group ID, and the right-most byte (in *italic* text) denotes the physical Fibre Channel port. In these examples VPGs 1 through 3 have corresponding virtual ports with **00**, **01**, and **02** presented out of physical FC ports `0` and `1`, with WWPNs ending in *f8* and *f9*, respectively.

The following example shows the information grouped by physical Fibre Channel port.

```
iSR6200 <1> (admin) #> show fc

  FC Port Information
  ---------------------
  FC Port                          1
  Port Status                      Enabled
  Link Status                      Up
  Current Link Rate                4Gb
  Programmed Link Rate             Auto
  WWNN                             20:00:00:c0:dd:13:16:f8 (VPGROUP_1)
  WWPN                             21:00:00:c0:dd:13:16:f8 (VPGROUP_1)
  Port ID                          0a-04-00 (VPGROUP_1)
  WWNN                             20:01:00:c0:dd:13:16:f8 (VPGROUP_2)
  WWPN                             21:01:00:c0:dd:13:16:f8 (VPGROUP_2)
  Port ID                          0a-04-01 (VPGROUP_2)
  WWNN                             20:02:00:c0:dd:13:16:f8 (VPGROUP_3)
  WWPN                             21:02:00:c0:dd:13:16:f8 (VPGROUP_3)
  Port ID                          0a-04-02 (VPGROUP_3)
  Firmware Revision No.            4.05.00
  Frame Size                       2048
  Execution Throttle               32768
  Connection Mode                  Point-to-Point
  Programmed Connection Option     Loop Preferred
  SFP Type                         8Gb

  FC Port                          2
  Port Status                      Enabled
  Link Status                      Up
  Current Link Rate                4Gb
  Programmed Link Rate             Auto
  WWNN                             20:00:00:c0:dd:13:16:f9 (VPGROUP_1)
  WWPN                             21:00:00:c0:dd:13:16:f9 (VPGROUP_1)
  Port ID                          0a-05-00 (VPGROUP_1)
  WWNN                             20:01:00:c0:dd:13:16:f9 (VPGROUP_2)
  WWPN                             21:01:00:c0:dd:13:16:f9 (VPGROUP_2)
  Port ID                          0a-05-01 (VPGROUP_2)
  WWNN                             20:02:00:c0:dd:13:16:f9 (VPGROUP_3)
  WWPN                             21:02:00:c0:dd:13:16:f9 (VPGROUP_3)
```

```
  Port ID                          0a-05-02 (VPGROUP_3)
  Firmware Revision No.            4.05.00
  Frame Size                       2048
  Execution Throttle               32768
  Connection Mode                  Point-to-Point
  Programmed Connection Option     Loop Preferred
  SFP Type                         8Gb

iSR6200 <1> (admin) #>
```

Notice also the VP index in the second byte from the left, and the Fibre Channel port indicator in the right-most byte.

To see this information using SANsurfer Router Manager, select one of the Fibre Channel ports, as shown in Figure 4-4.

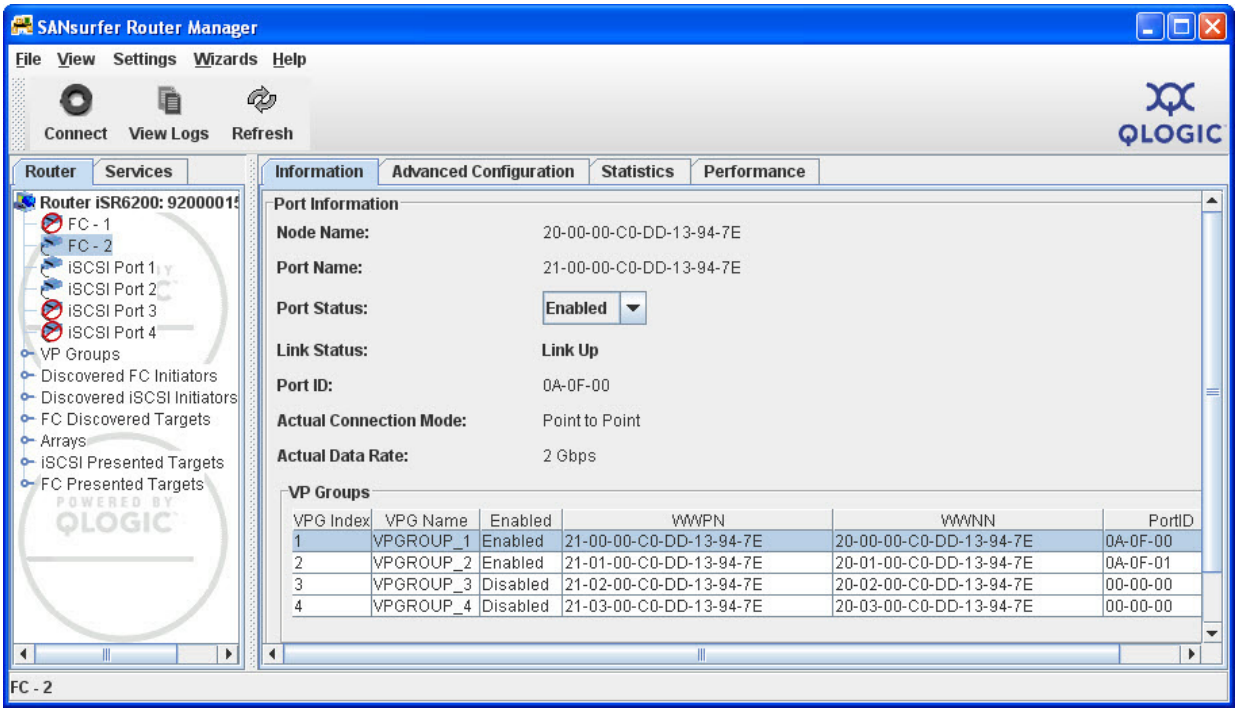


Figure 4-4. FC Port Information Page

NOTE

For more details on using the utility, use the SANsurfer Router Manager Help or refer to the *iSR6200 Router Manager User's Guide*.

Zoning Virtual Port Groups on the SAN

When zoning the iSR6200 virtual port group WWPNs to a Fibre Channel array, you must ensure all WWPNs of a virtual port group are zoned to any single Fibre Channel target WWPN. Figure 4-5 shows the proper zoning for a single blade iSR6200 with three VP groups enabled using a single Fibre Channel switch.

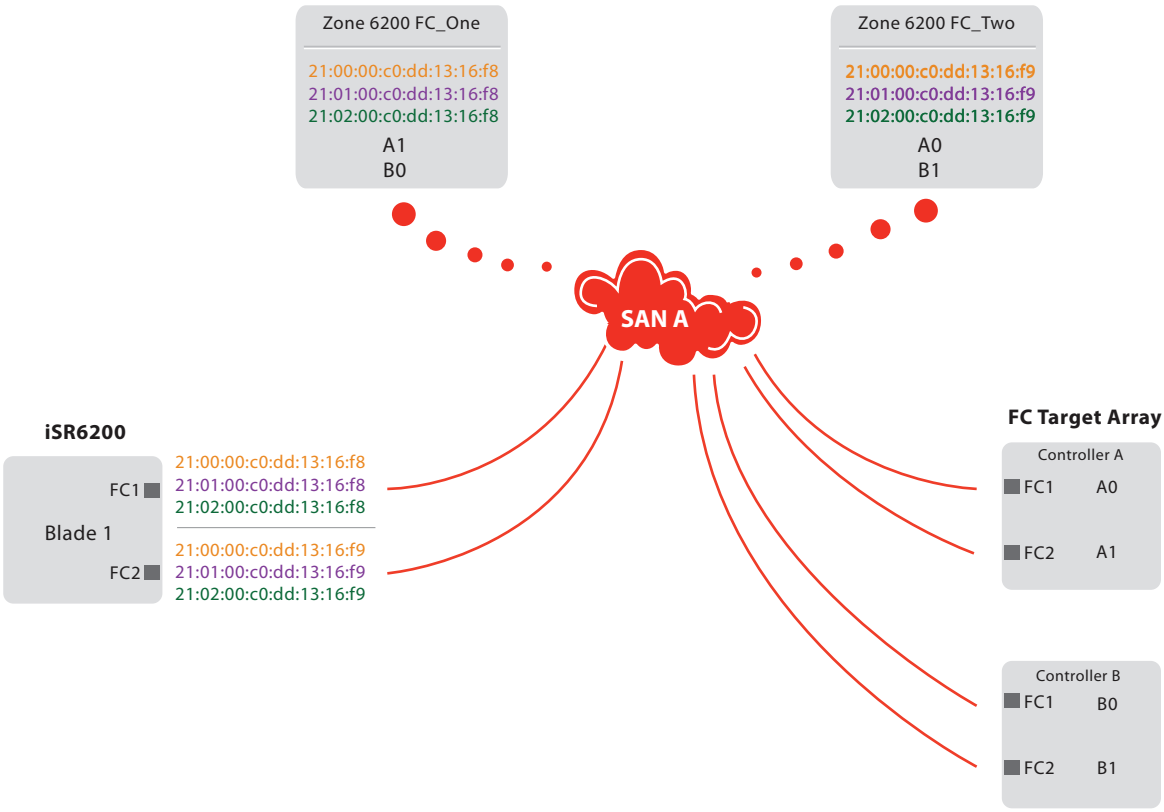


Figure 4-5. Single Blade, Single Fibre Channel Switch

When connecting a single-bladed iSR6200 to two independent SANs, connect one Fibre Channel port from your iSR6200 blade to each SAN (see Figure 4-6). This topology ensures Fibre Channel link-level and switch-level failure protection.

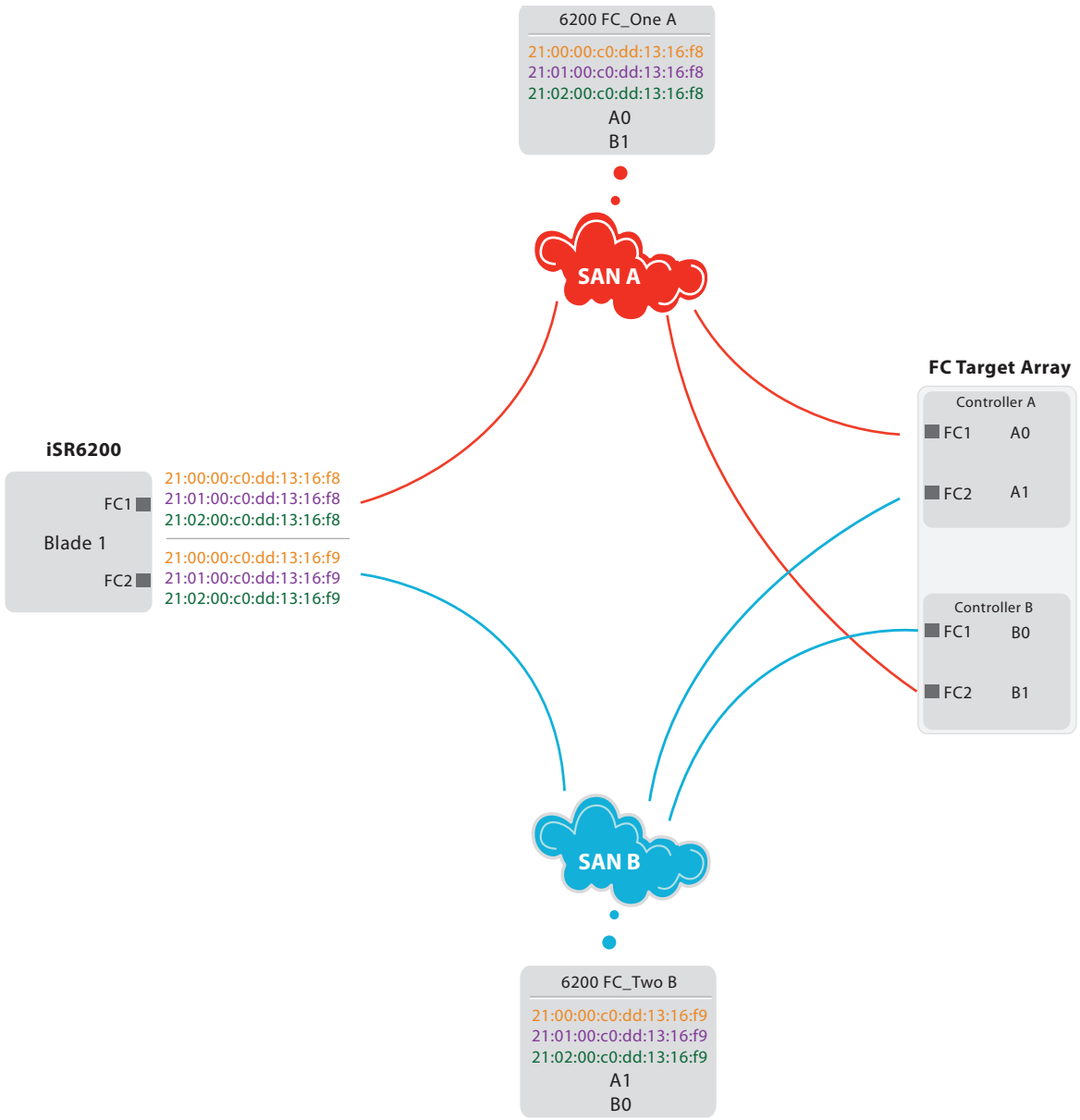


Figure 4-6. Single Blade, Dual Fibre Channel Switch

When connecting a dual-blade iSR6200 for high availability, connect one Fibre Channel port from each blade to each of your fabrics (see Figure 4-7). This topology provides link-level, switch-level, and blade-level failure protection. To make this effective, you must connect the iSCSI hosts to both iSR6200 blades. For details, see “Connecting iSCSI Hosts to the iSR6200” on page 4-16.

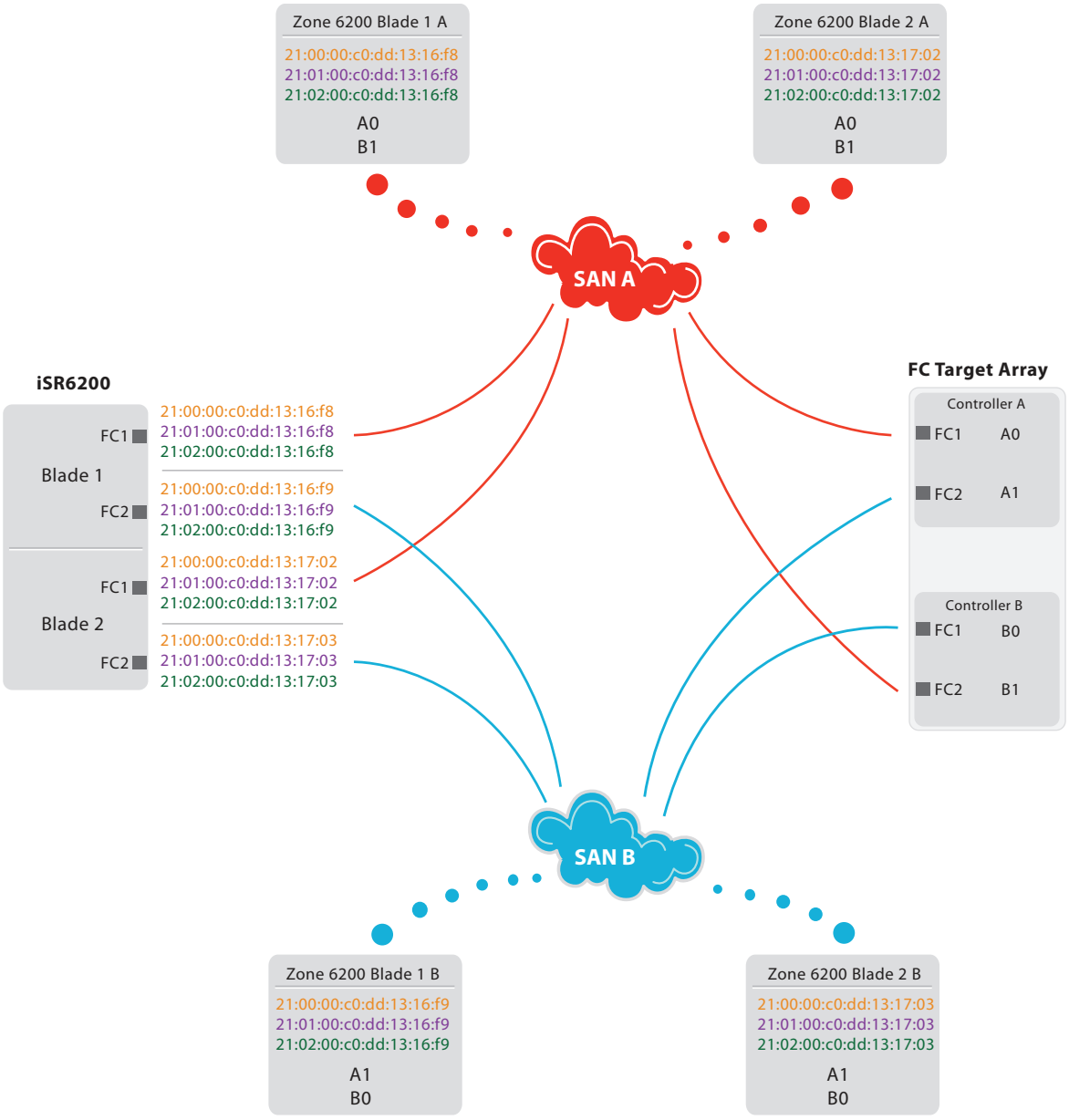


Figure 4-7. High-Availability, Dual Blades, Dual Fibre Channel Switches

Configuring Fibre Channel Array Hosts and LUN Assignments

When configuring Fibre Channel array hosts, you must treat each iSR6200 virtual port group (VPG) as its own unique Fibre Channel host within the virtualized storage array. This means if you have only one VPG enabled, the iSR6200 will have only one host entity. If you enable two more VPGs, the iSR6200 presents three separate host entities to your storage array.

Each host entity must contain WWPNs from the same VPG. Figure 4-8 shows a correct configuration.

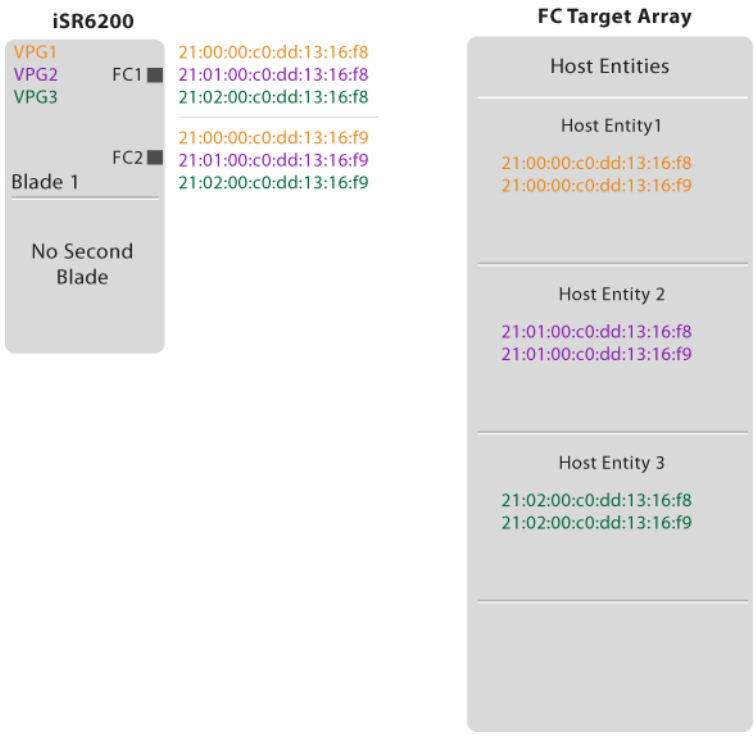


Figure 4-8. Correctly Configured Storage Array Using Virtual Port Groups

Do not simply group all Fibre Channel ports from the iSR6200 router into a single host entity. Doing so defeats the purpose of virtual port groups, limiting you to 256 LUNs. It will also cause problems when you later try to restore access to additional LUNS.

Figure 4-9 illustrates this incorrect configuration.

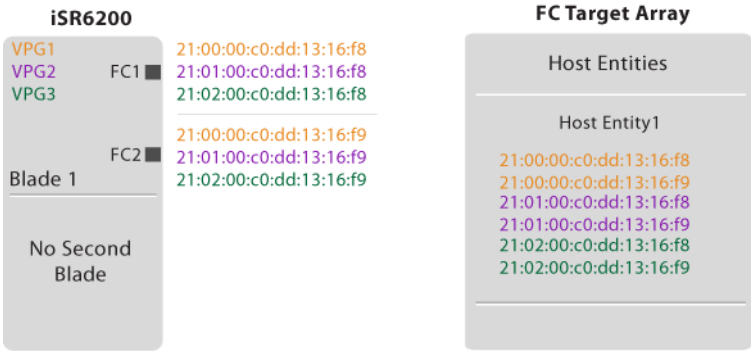


Figure 4-9. Incorrectly Configuring All Groups to One Host Entity

Figure 4-10 shows an incorrect assignment of virtual port group WWPNs. Notice that host entity 1 and host entity 2 both contain ports from more than one VPGroup.

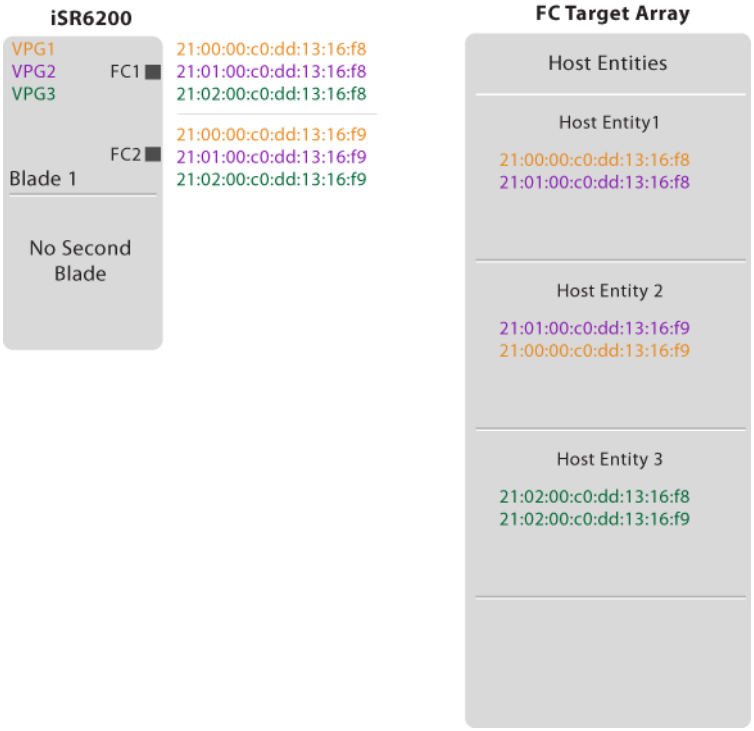


Figure 4-10. Incorrectly Assigning VPG WWPNs

If you are using two blades in a high availability configuration, assign each VPG from the second 6200 blade in the same chassis to the same host entity as VPG from blade 1, as shown in Figure 4-11.

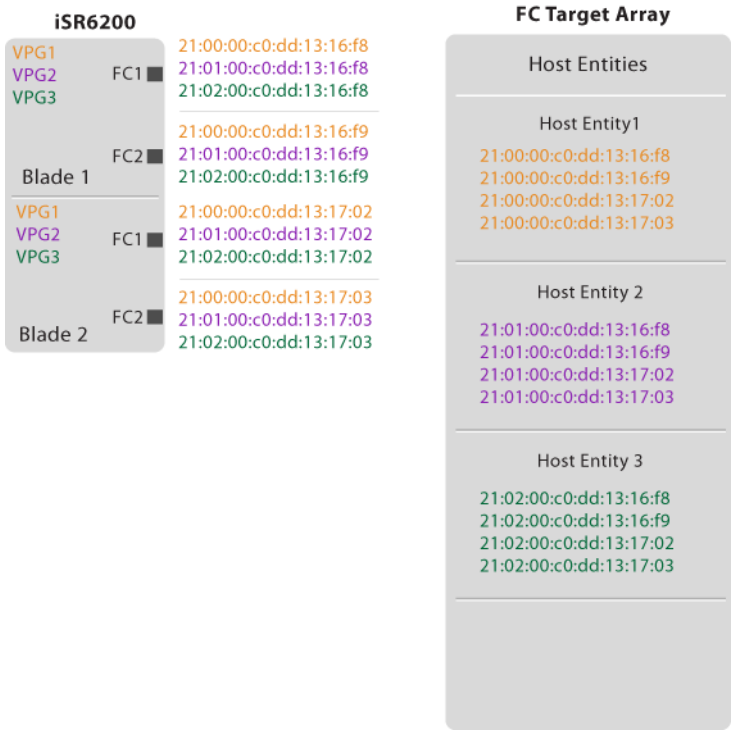


Figure 4-11. Correct VPG Assignments for High Availability Configuration

Do not put VPG ports in host entities with other Fibre Channel hosts.

When assigning LUNs to your VPG host entities, do not assign the same LUN to two VPG host entities. Figure 4-12 shows a valid LUN presentation. Each LUN is presented to only one VPG. Any of these LUNs can be presented to any number of other Fibre Channel hosts on the array, but can be presented to one and only one VPG of the iSR6200.

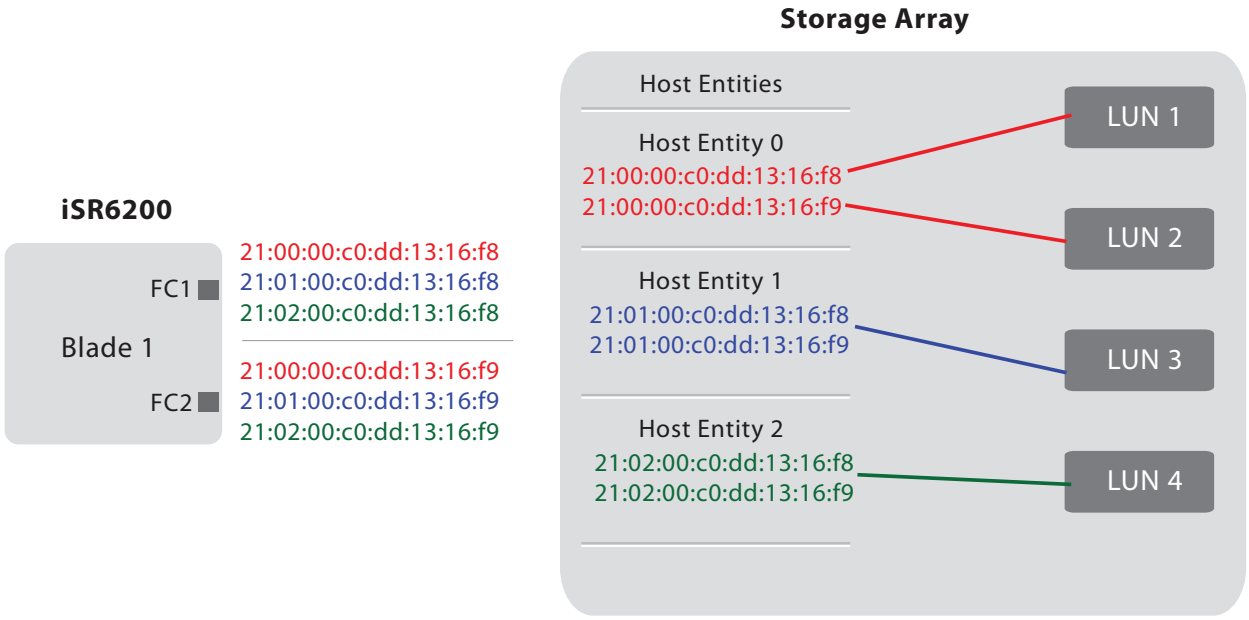


Figure 4-12. Correctly Assigning LUNs to Your VPG Host Entities

Figure 4-13 shows presenting LUN 3 incorrectly. If an iSCSI host logged into both VPG0 and VPG1, it would have access to LUN 3 through two virtual port groups. This is invalid and will lead to serious problems.

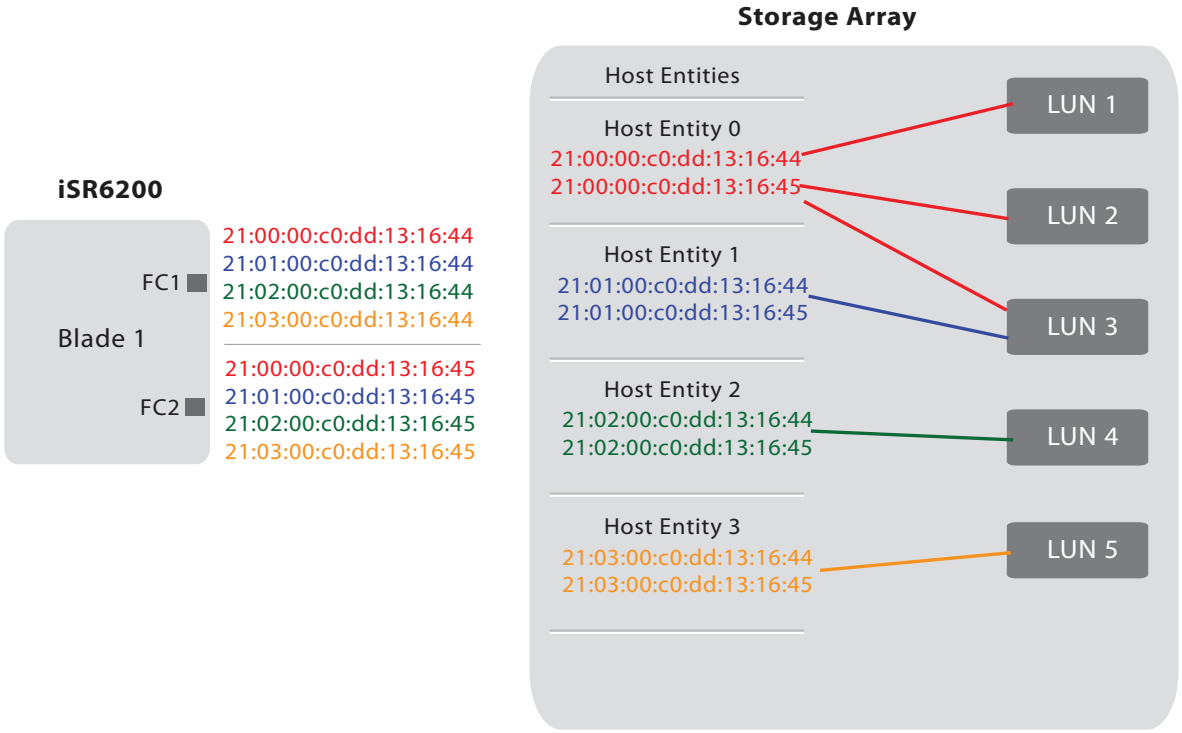


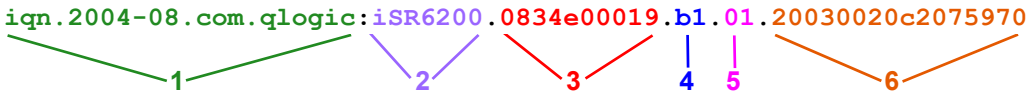
Figure 4-13. Incorrectly Presenting LUN 3

Presenting the LUN at different LUN indexes for each VP will confuse the iSCSI host MPIO software because it will see the same LUN WWLUNID at two different indexes. This can cause the multipath I/O (MPIO) driver to panic and show a blue screen. Without an MPIO driver, the system could corrupt data on the LUN, without crashing—a situation you want to avoid.

Connecting iSCSI Hosts to the iSR6200

Upon logging into a Fibre Channel target WWPN, an iSR6200 blade presents an iSCSI target to which iSCSI initiators can connect. This target is defined by its iSCSI qualified name (IQN) string. To correctly connect iSCSI initiators to Fibre Channel targets through the iSR6200, it is important to understand the composition of the iSCSI target IQN string.

The following example shows the anatomy of a sample IQN string from an iSR6200 router:



1. **Vendor name and registration date**
2. **Product Name**
3. **iSR6200 Chassis Serial Number**
4. **Blade (b1 or b2)**
5. **VPGroup (01 through 04)**
6. **Fibre Channel target WWPN**

Notice that the IQN string does not contain any information about the physical iSR6200 iSCSI port. iSCSI load balancing and failover are handled by the iSCSI host and not the iSR6200. Also notice that the IQN string does not contain any information indicating which physical iSR6200 Fibre Channel port the target device is connected.

You can view the complete list of IQN strings that your iSR6200 is presenting with the `show presented_targets` command in the CLI. For example:

```
iSR6200 <1> (admin) #> show presented_targets

  Presented Target Information
  ----------------------------

  iSCSI Presented Targets
  -----------------------
  Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.00.20030020c2075970
  Alias
  <MAPS TO>
  WWNN     10:00:00:20:c2:07:59:70
  WWPN     20:03:00:20:c2:07:59:70

  Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.00.21040020c2075970
  Alias
  <MAPS TO>
  WWNN     10:00:00:20:c2:07:59:70
  WWPN     21:04:00:20:c2:07:59:70
```

To view presented target information using SANsurfer Router Manager, expand the **iSCSI Presented Targets** node in the left pane, and then select the device, as shown in Figure 4-14.

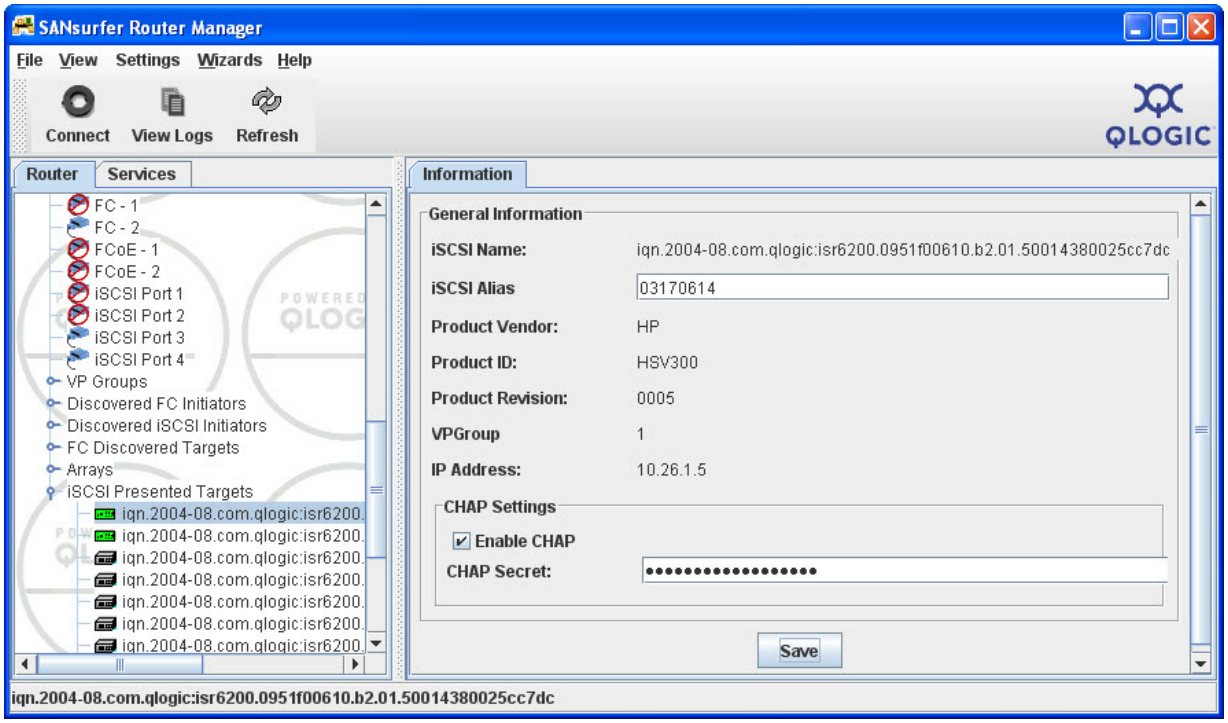


Figure 4-14. Selecting the iSCSI Presented Targets in SANsurfer Router Manager

Enabling additional VP Groups creates multiple IQN strings for the same Fibre Channel target WWPN. The following example shows two Fibre Channel target WWPNs and three VP groups, resulting in six presented iSCSI qualified names. For information about how to enable and configure additional VP Groups, see “Enabling Virtual Port Groups” on page 4-2.

```
iSR6200 <1> (admin) #> show targets

  Target Information
  ------------------
  WWNN              10:00:00:20:c2:07:59:70
  WWPN              20:03:00:20:c2:07:59:70
  Port ID           0a-02-00
  State             Online

  WWNN              10:00:00:20:c2:07:59:70
  WWPN              21:04:00:20:c2:07:59:70
  Port ID           0a-03-00
  State             Online
```

```
iSR6200 <1> #> show vpgroups

  VpGroup Information
  ---------------------
  Index                    1
  VpGroup Name             VPGROUP_1
  Status                   Enabled
  WWPNs                    21:00:00:c0:dd:13:16:f8
                           21:00:00:c0:dd:13:16:f9

  Index                    2
  VpGroup Name             VPGROUP_2
  Status                   Enabled
  WWPNs                    21:01:00:c0:dd:13:16:f8
                           21:01:00:c0:dd:13:16:f9

  Index                    3
  VpGroup Name             VPGROUP_3
  Status                   Enabled
  WWPNs                    21:02:00:c0:dd:13:16:f8
                           21:02:00:c0:dd:13:16:f9

  Index                    4
  VpGroup Name             VPGROUP_4
  Status                   Disabled
  WWPNs                    N/A

iSR6200 <1> (admin) #> show presented_targets

  Presented Target Information
  ----------------------------

  iSCSI Presented Targets
  -------------------------
  Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.01.20030020c2075970
  Alias
  <MAPS TO>
  WWNN     10:00:00:20:c2:07:59:70
  WWPN     20:03:00:20:c2:07:59:70

  Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.01.21040020c2075970
```

```
Alias
<MAPS TO>
WWNN     10:00:00:20:c2:07:59:70
WWPN     21:04:00:20:c2:07:59:70

Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.02.20030020c2075970
Alias
<MAPS TO>
WWNN     10:00:00:20:c2:07:59:70
WWPN     20:03:00:20:c2:07:59:70

Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.02.21040020c2075970
Alias
<MAPS TO>
WWNN     10:00:00:20:c2:07:59:70
WWPN     21:04:00:20:c2:07:59:70

Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.03.20030020c2075970
Alias
<MAPS TO>
WWNN     10:00:00:20:c2:07:59:70
WWPN     20:03:00:20:c2:07:59:70

Name     iqn.2004-08.com.qlogic:iSR6200.0834e00019.r1.03.21040020c2075970
Alias
<MAPS TO>
WWNN     10:00:00:20:c2:07:59:70
WWPN     21:04:00:20:c2:07:59:70
```

iSCSI host LUN access is determined by the specific iSCSI target to which the host connects. Pay special attention to the VPG index portion of the IQN string; it is critical to understanding which group of storage array LUNs the host will access.

In Figure 4-15, the iSCSI host has logged into iSCSI target for VPG0. The host can access VPG0 LUNs 1 and 2 from the storage array.

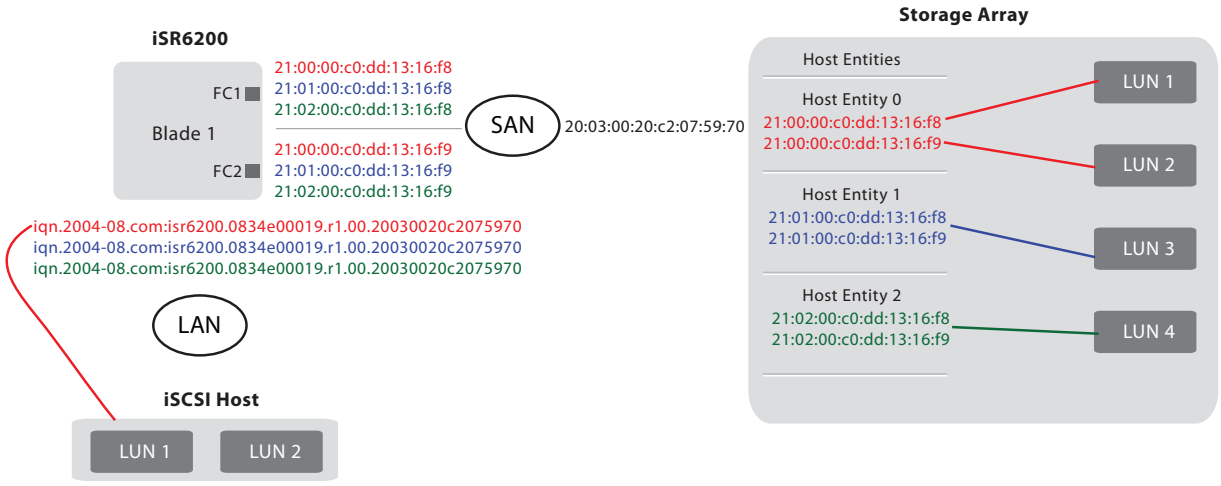


Figure 4-15. Host Access to LUNs on Storage Array

In Figure 4-16, the iSCSI host has logged into iSCSI target for VPG1. The host can access VPG1 LUN #3 from the storage array.

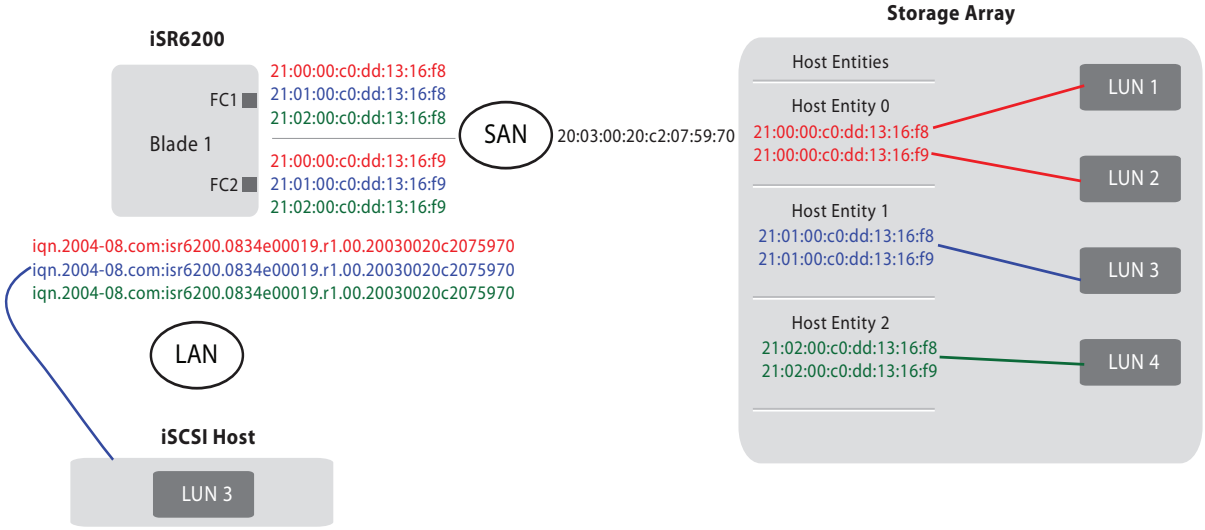


Figure 4-16. iSCSI Host Logged into iSCSI Target for VPG0

In Figure 4-17, the iSCSI host has logged into iSCSI targets for both VPG1 and VPG2. The host can access both VPG1 and VPG2 LUNs 3 and 4.

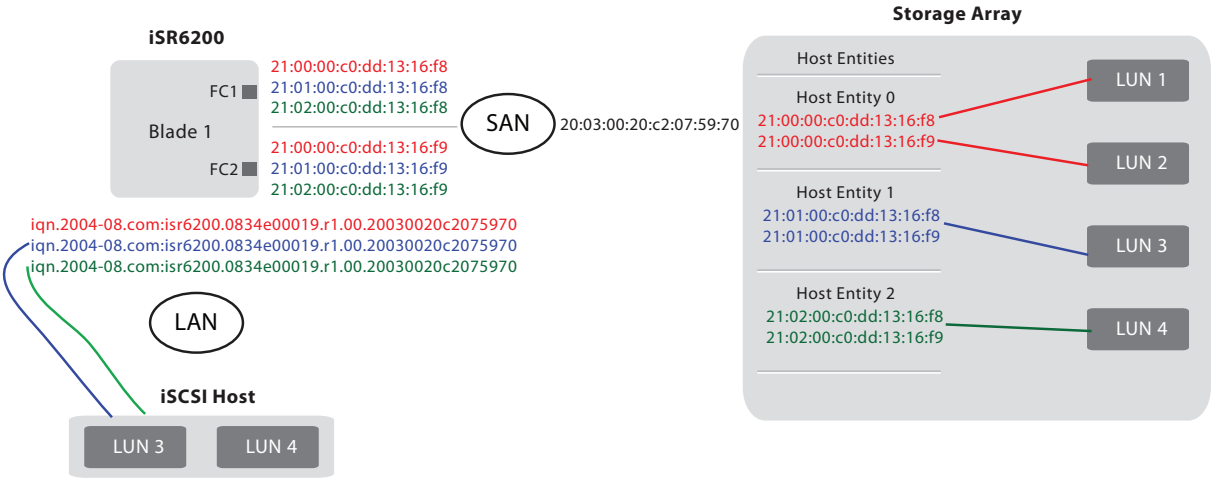


Figure 4-17. iSCSI Host Logged into iSCSI Target for VPG1

Controlling per-Host LUN Access on the iSR6200

The iSR6200 allows multiple iSCSI initiators to connect to a single Fibre Channel target through a specific VPG. Controlling individual LUN access for each iSCSI host requires *LUN mapping* devices connected through the iSR6200.

NOTE

Before proceeding with this section, be sure you have read and understand the previous sections of this chapter.

Figure 4-18 shows that even after logging into the VPG0 iSCSI target, the host cannot access data LUNs on the storage array. To allow the iSCSI host access to each LUN, you must configure the iSR6200 using either SANsurfer Router Manager or the CLI.

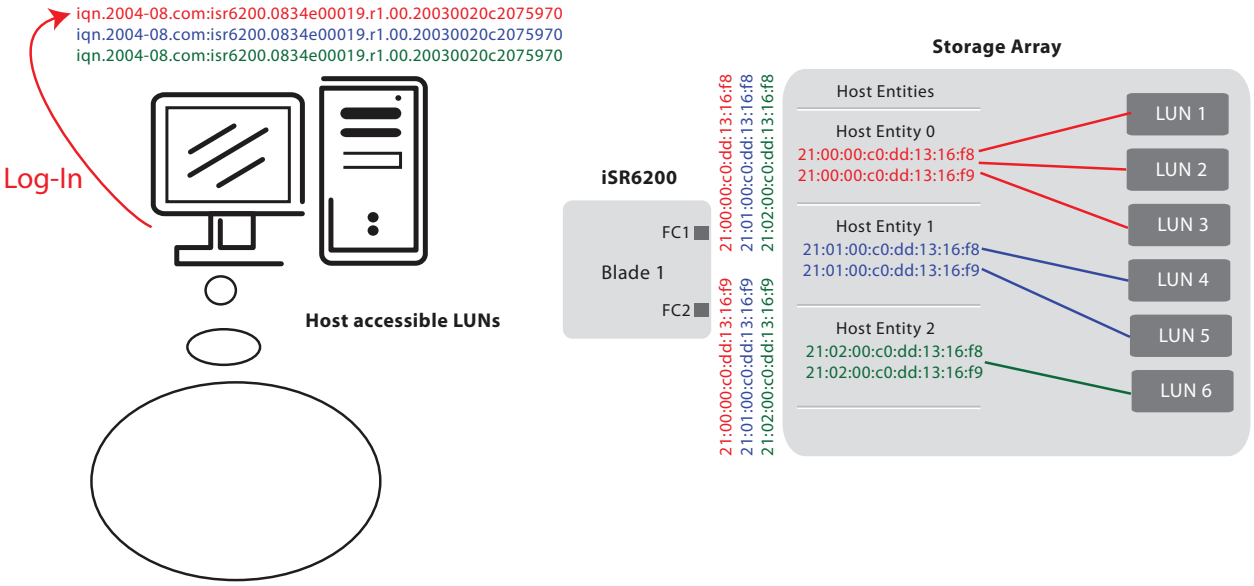


Figure 4-18. Logging into Target Before LUN Mapping

The following example shows how to map the LUN targets with initiators using CLI commands.

```
iSR6200 <1> (admin) #> lunmask add

  Index    Mapped   (WWNN,WWPN/iSCSI Name)
  -----    ------   ----------------------
  0        Yes      iqn.1991-05.com.microsoft:winhaz38

  Please select an Initiator from the list above ('q' to quit):  0

  Index    (VpGroup Name)
  -----    --------------
  1        VPGROUP_1
  2        VPGROUP_2
  3        VPGROUP_3
  4        VPGROUP_4

  Multiple VpGroups are currently 'ENABLED'.
  Please select a VpGroup from the list above ('q' to quit):  1
```

```
Index    (WWNN,WWPN/iSCSI Name)
-----    ----------------------
0        50:06:01:60:c1:e0:0d:a2,50:06:01:60:41:e0:0d:a2
1        50:06:01:60:c1:e0:0d:a2,50:06:01:68:41:e0:0d:a2

Please select a Target from the list above ('q' to quit):  0

Index   (LUN/VpGroup)      Vendor
-----   -------------      ------
1       1/VPGROUP_1        DGC
2       2/VPGROUP_1        DGC
3       3/VPGROUP_1        DGC

Please select a LUN to present to the initiator ('q' to quit):  1

All attribute values that have been changed will now be saved.
```

Figure 4-19 shows the effect of mapping an initiator to LUN 1 using the CLI commands shown in the preceding example.

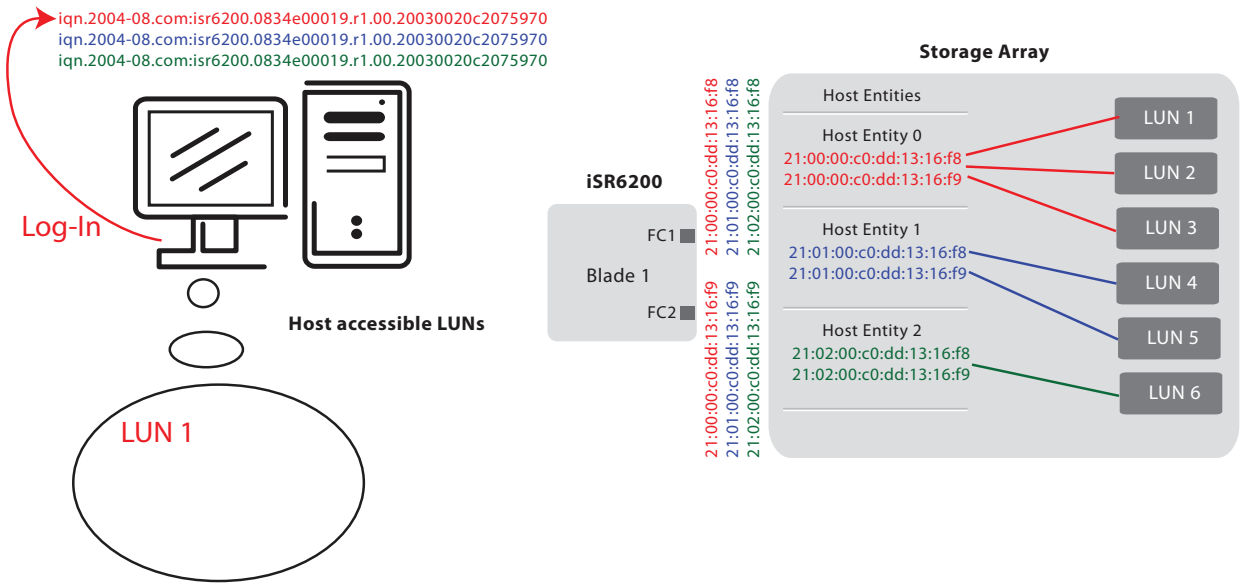


Figure 4-19. Logging into Target After Mapping LUN 1

You can accomplish the same LUN mapping using the SANsurfer Router Manager's Target Presentation/LUN Mapping Wizard.

To map LUN 1 to an initiator using SANsurfer Router Manager:

1. On the **Wizards** menu, click **Presentation Wizard**.

   The Target Presentation/LUN Mapping Wizard opens.

2. On the Select the Initiators for the LUN Presentation window, select an initiator as shown in Figure 4-20, and then click **Next**.

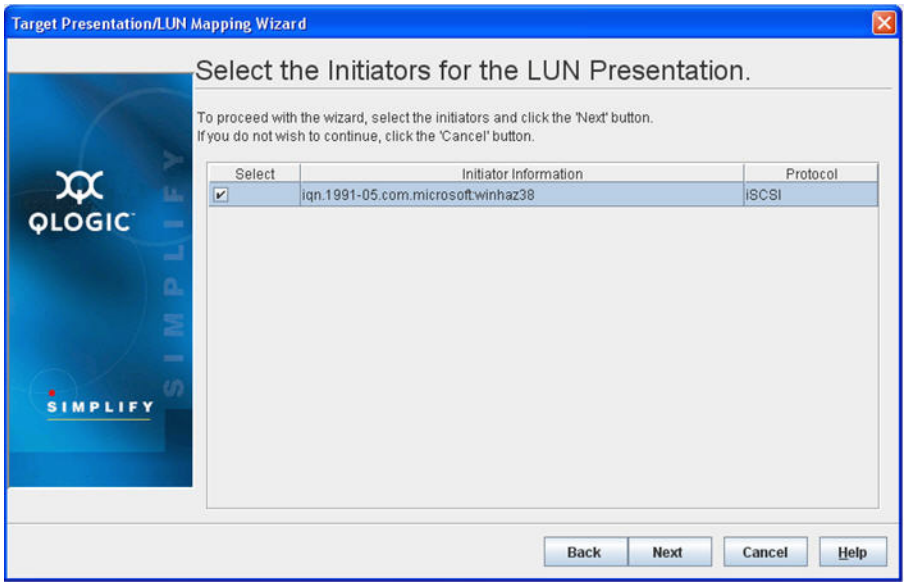


Figure 4-20. Target Presentation/LUN Mapping Wizard—Select the Initiators

3. On the LUN Selection window, select LUN1 as shown in Figure 4-21, and then click **Next**.

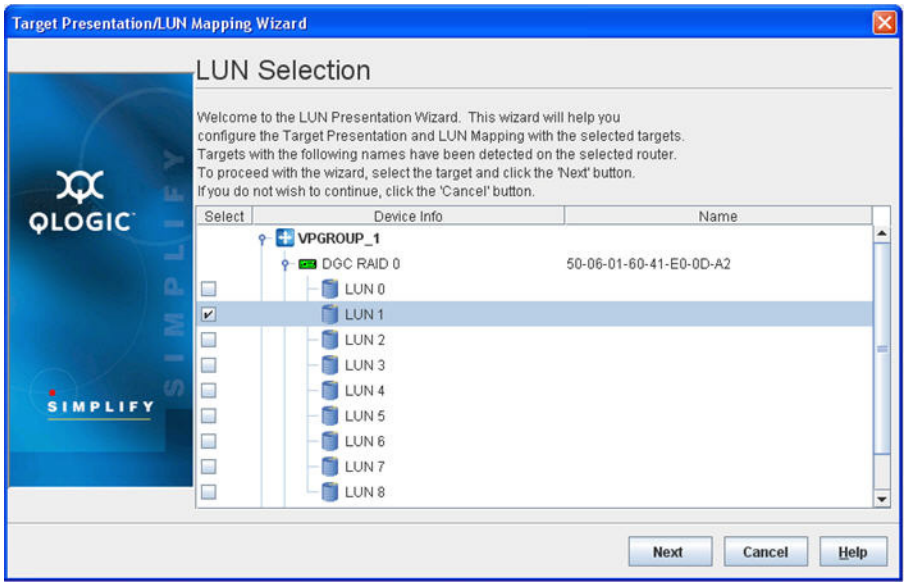


Figure 4-21. Target Presentation/LUN Mapping Wizard—LUN Selection

The LUN Masking Configuration Status window opens, and the Security Check dialog box prompts you to enter the admin password.

4. In the Security Check dialog box, type the system password (the default is *config*), and then click **Next**.

The LUN Masking Configuration Status window lists the mapping requests, as shown in Figure 4-22.

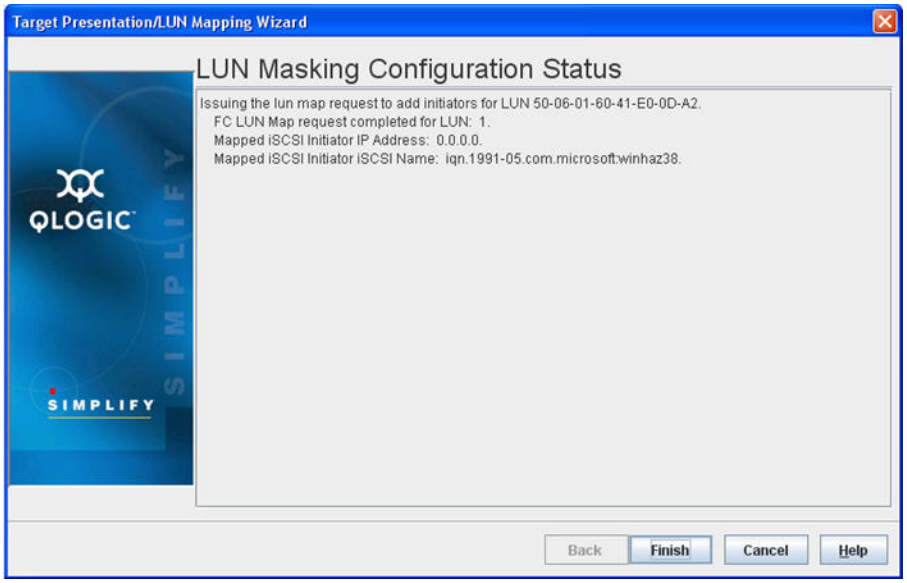


Figure 4-22. Target Presentation/LUN Mapping Wizard—LUN Masking Configuration Status

5. Verify the completion status shown on the LUN Masking Configuration Status window, and then click **Finish** to close the wizard.

You can map additional LUNs using either SANsurfer Router Manager or the CLI. The iSCSI host cannot access mapped LUNs until it logs into the presented target for the corresponding iSR6200 virtual port group and Fibre Channel target WWPN.

Figure 4-23 uses color coding to identify the LUN mapping that became available after the host logs into the presented targets.

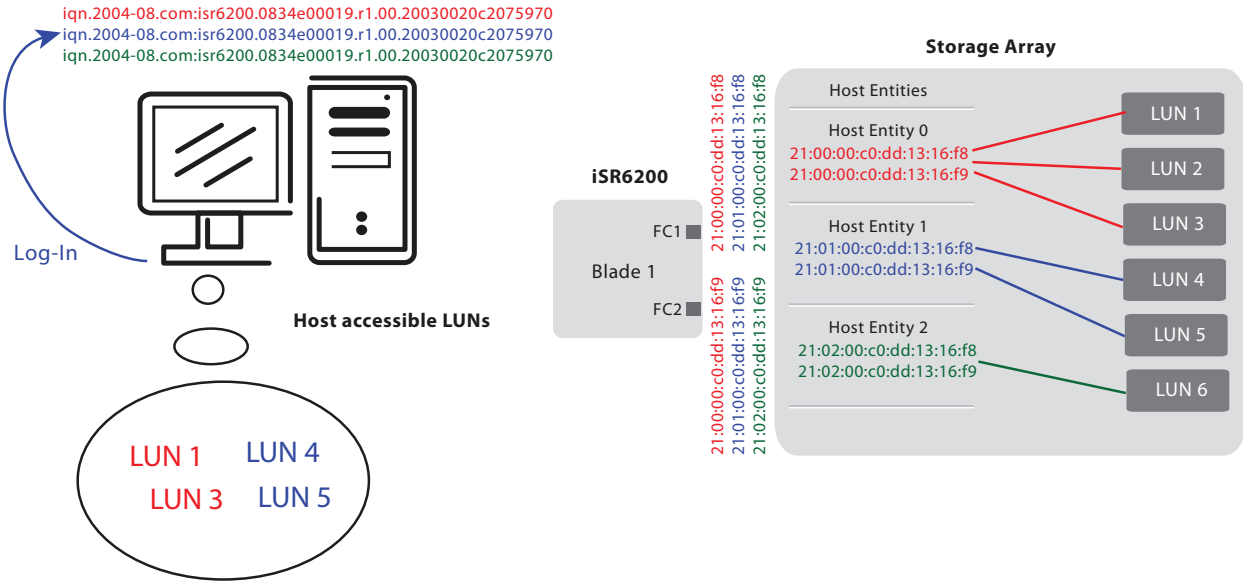


Figure 4-23. Logging In with Mapped LUNs

If you plan to allow all iSCSI hosts unrestricted access to all discovered Fibre Channel LUNs, you can completely disable LUN mapping using either SANsurfer Router Manager or CLI commands.

The following example shows how to do this using the `set system` CLI command. The red text shows entering the command that enables the LUN mapping.

```
iSR6200 <1> (admin) #> set system
  A list of attributes with formatting and current values will follow.
  Enter a new value or simply press the ENTER key to accept the current value.
  If you wish to terminate this process before reaching the end of the list
  press 'q' or 'Q' and the ENTER key to do so.
  WARNING:
  If enabled by operator, the Symbolic Name can be embedded as part of the
  iSCSI Name.  Changes to the iSCSI name will be effective after a reboot.
  Only valid iSCSI name characters will be accepted.  Valid characters include
  alphabetical (a-z, A-Z), numerical (0-9), colon, hyphen, and period.
  Changes to the Settings below will be effective after a reboot.
  System Symbolic Name (Max = 64 characters)          [Blade-1         ]
  Embed Symbolic Name  (0=Enable,1=Disable)           [Disabled        ]
  Target Presentation Mode (0=Auto, 1=Manual)         [Auto            ]
  Lun Mapping (0=Enable, 1=Disable)                   [Disabled        ]
  Controller Lun AutoMap  (0=Enable, 1=Disable)       [Enabled         ]
  Target Access Control  (0=Enable, 1=Disable)        [Disabled        ]
  Telnet (0=Enable, 1=Disable)                        [Enabled         ]
  SSH (0=Enable, 1=Disable)                           [Enabled         ]

  All attribute values that have been changed will now be saved.
```

NOTE

- You must reboot the router to change the LUN mapping status, whether you are enabling it or disabling it.
- If you are running a dual-blade HA configuration, make sure both blades have the same setting.

Figure 4-24 shows how to enable LUN mapping on an iSR6200 blade 1. To apply these changes, you must click **Save**, type the system password, and then reboot the router blade.

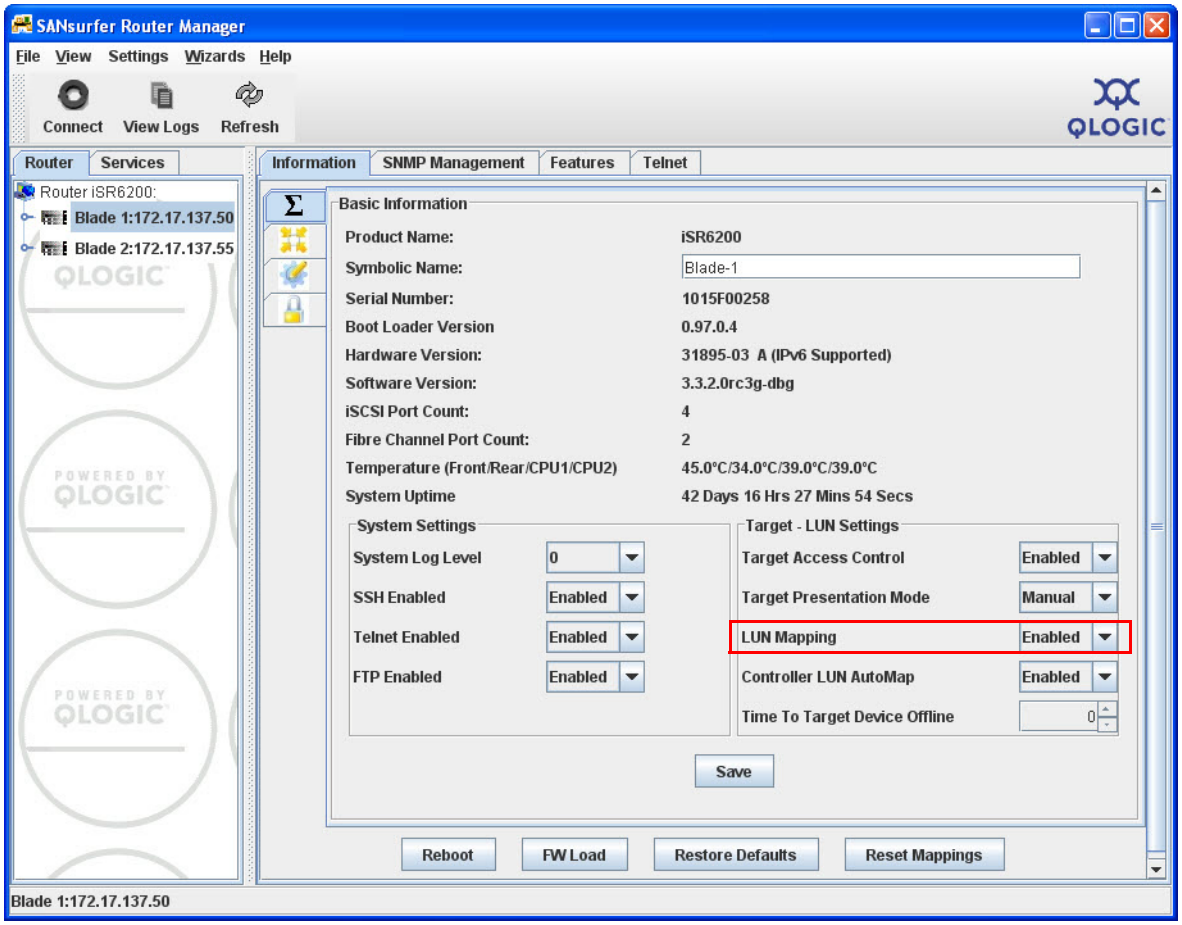


Figure 4-24. Enabling LUN Mapping

Figure 4-25 shows host LUN access with **LUN Mapping** disabled.

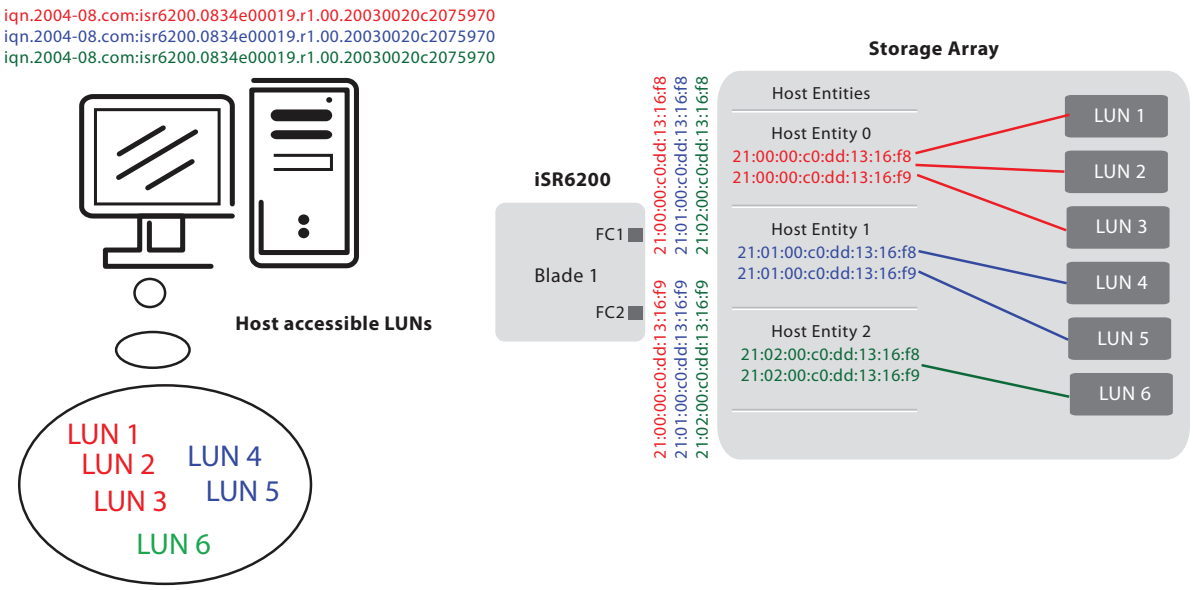


Figure 4-25. Host LUN Access with LUN Masking Disabled

NOTE

The iSR6200 router can access LUNs only after the host logs into iSR6200 presented iSCSI target(s).

5 Fibre Channel over IP

Fibre Channel over IP (FCIP) is a protocol used to transport Fibre Channel frames over TCP/IP, thus providing SAN over WAN capabilities. FCIP is commonly used to interconnect (merge) SANs that are separated by such a distance that a direct connection is cost prohibitive or technically unfeasible.

This chapter provides the following information:

- FCIP Attributes lists the attributes of FCIP implementation in the iSR6200.
- "Configuring FCIP" on page 5-2 explains the parameters used in setting up FCIP, E_Port and F_Port extensions, WAN characteristics, data compression, bandwidth, and TCP window settings.

FCIP Attributes

The iSR6200 system FCIP implementation has the following attributes:

- Compatible with all Fibre Channel vendor fabrics (all Fibre Channel switches)
- E_Port extension—Bridges same Fibre Channel vendor SANs (such as Fibre Channel switches)
- F_Port extension—Does not merge fabrics
- Supported configurations:
  - Two same-vendor Fibre Channel SAN islands
  - Direct connect from one N_Port to a remote SAN island
- Support for 1GbE and 10GbE connections:
  - 100MBps on each 1Gb Ethernet or 8Gb Fibre Channel route
  - 400MBps on each 10Gb Ethernet or 8Gb Fibre Channel route
- Compression at 1.5Gbps
- TCP/IP selective acknowledgement (SACK) of packets
- Support for bandwidth throttling
- Distances up to 250ms with TCP window size up to 16M
- Trace route and ping support

- Links up to two locations per blade, four locations per chassis (two blades)
- FICON® support

Configuring FCIP

To successfully configure FCIP, you need to assess both the SAN and WAN environments. The following list is provided to support the assessment.

- Extension port type:
  - E_Port—See “E_Port Extension” on page 5-52.2 for a description and examples.
  - F_Port—See “F_Port Extension” on page 5-7 for a description and examples.
- For E_Ports, the number of ISLs (inter-switch links):
  - One
  - Two
- WAN characteristics:
  - Round-trip time (RTT)—See “Round-Trip Time” on page 5-10
  - Data rate—See “Link Data Rate” on page 5-11
  - Quality—See “Link Quality” on page 5-11
  - Firewall—See“Firewall” on page 5-13
  - Available WAN bandwidth—See “Bandwidth Limiting” on page 5-15

Table 5-1 provides space for you to write down the information that you must obtain prior to configuring an FCIP route.

Table 5-1. FCIP Preconfiguration Information

Router Being Configured	
IP Address	
Subnet Mask	
Gateway	
VLAN ID and Priority	
Peer Router (Remote)	
IP Address	

Configuring an FCIP Route Using the CLI

This section shows an example of the `fciproute add` command and provides the steps to configure an FCIP route in the CLI (the GUI procedure is essentially the same).

```
iSR6200 <1> (admin) #> fciproute add

  A list of attributes with formatting and current values will follow.
  Enter a new value or simply press the ENTER key to accept the current value.
  If you wish to terminate this process before reaching the end of the list
  press 'q' or 'Q' and the ENTER key to do so.

  WARNING:
  The following command might cause a loss of connections to both GE ports.

  Configuring FCIP Route:
  -----------------------
  FCIP Interfaces FC & GE (0=Enable, 1=Disable) [Enabled        ]
  FC Port (1=FC1 2=FC2)                         [               ] 1
  GE Port (1=GE1 2=GE2)                         [               ] 1
  IP Address (IPv4 or IPv6; 0=IPv6 Link Local)  [0.0.0.0        ] 192.168.1.227
  Subnet Mask                                   [0.0.0.0        ] 255.255.255.0
  Gateway IP Address                            [0.0.0.0        ]
  Remote IP Address                             [0.0.0.0        ] 192.168.1.228
```

```
MTU Size (0=Normal, 1=Jumbo, 2=Other)          [Normal          ]
TCP Window Size (0=8KB, 1=16KB, 2=32KB)        [32768           ]
Window Scaling (0=Enable, 1=Disable)           [Enabled          ]
Window Scaling Factor (Min=0, Max=9)           [7                ]
TCP Port No. (Min=1024, Max=65535)             [3225             ]
GE Port Speed (0=Auto, 1=100Mb, 2=1Gb)         [Auto             ]
Bandwidth, Mbit/sec (Min=1, Max=1000)          [1000             ]
VLAN (0=Enable, 1=Disable)                     [Disabled         ]
FCIP SW Compression (0=Enable, 1=Disable)      [Disabled         ]

All attribute values for FCIP Route 1 will now be saved.
```

NOTE

No action is taken on any of the settings until you complete the last step. To cancel FCIP route configuration, enter `q` for any parameter.

To configure FCIP in the CLI:

1. From a command prompt, enter the `fciproute add` command.
2. Enable (or disable) the `FCIP Interfaces FC & GE` ports to be used by the FCIP route.
3. At the `FC Port` prompt, enter the number corresponding to the FC port to be used for this FCIP route.
4. At the `GE Port` prompt, enter the number corresponding to the GE port to be used for this FCIP route.
5. At the `IP Address` prompt, enter the router's GE port IP address (the router being configured).
6. At the `Subnet Mask` prompt, enter the router's GE port subnet mask.
7. At the `Gateway IP Address` prompt, enter the router's GE port gateway IP address.
8. At the `Remote IP Address` prompt, enter the remote (peer) router's IP address.
9. At the `MTU Size` prompt, specify the maximum transmission unit (MTU), either `0`=Normal, `1`=Jumbo, or `2`=Other.

   The MTU size is typically set to `Normal` (1,500 bytes). If all segments of the WAN support jumbo frames (9,000 bytes), select `Jumbo`. The `Other` option is typically used for WANs using encryption that requires the frame to be less than 1,500 bytes due to encryption overhead.

10. At the `TCP Window Size` prompt, specify the window size for the WAN as determined in "TCP Window Settings" on page 5-15.
11. At the `Window Scaling` prompt, enable or disable this setting. Window scaling must be enabled when using a `Window Scaling Factor` (see next step) greater than zero.
12. At the `Window Scaling Factor` prompt, enter a value from `0` through `9` as scaling factor, based on the `TCP Window Size` for the WAN specified in Step 10 (see "TCP Window Settings" on page 5-15).
13. (Optional) Changing the TCP port number at the `TCP Port No.` prompt should not be required. If you change this value, do *not* use a well-known TCP port number. The TCP port numbers on both the local and remote routers should be the same.
14. At the `GE Port Speed` prompt, select a GE port speed that matches that of the Ethernet switch port to which it is connected. QLogic recommends that you use a gigabit managed switch that is capable of automatically negotiating the port speed. If the Ethernet switch port speed is not capable of auto negotiation, set both the router and Ethernet switch to the same port speed.
15. At the `Bandwidth, Mbit/sec` prompt, enter a value from `1` through `1000 f`or the route bandwidth. To determine this value, see "Bandwidth Limiting" on page 5-15.
16. At the `VLAN` prompt, enable or disable VLAN support as needed. Enable VLAN only if it is supported by the Ethernet switch.
17. At the `FCIP SW Compression` prompt, enable or disable data compression (see "Data Compression" on page 5-15 to determine if compression should be enabled).

E_Port Extension

The FCIP configuration used to interconnect (merge) two SANs separated by distance is referred to as an *E_Port extension*. The SANs to be interconnected (merged) must be made up of similar Fibre Channel switches, from the same manufacturer, and support ISLs using the E_Port protocol.

Figure 5-1 shows an example of a single FCIP route (single ISL).

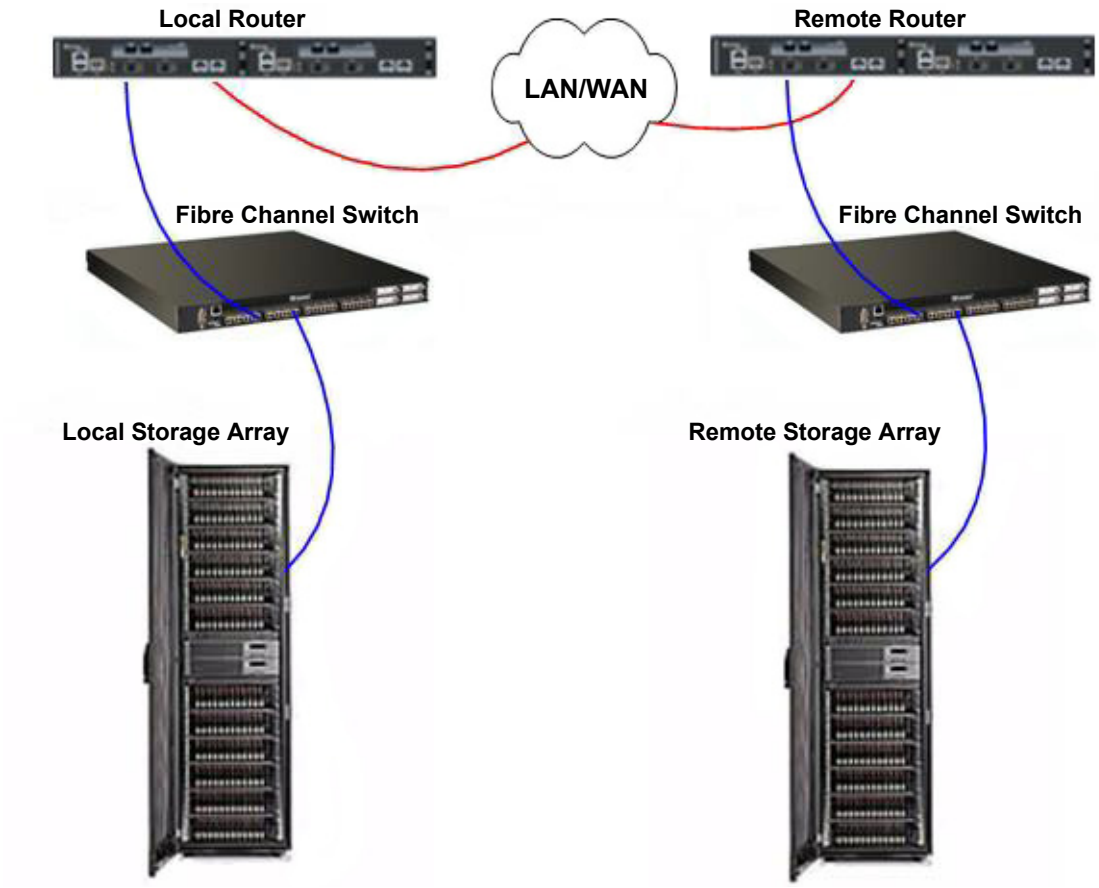


Figure 5-1. E_Port Extension, Single ISL

Figure 5-2 shows an example of a two FCIP routes (dual ISLs). This example assumes that the Fibre Channel switches have the ability to load-balance between the ISLs to enhance performance.

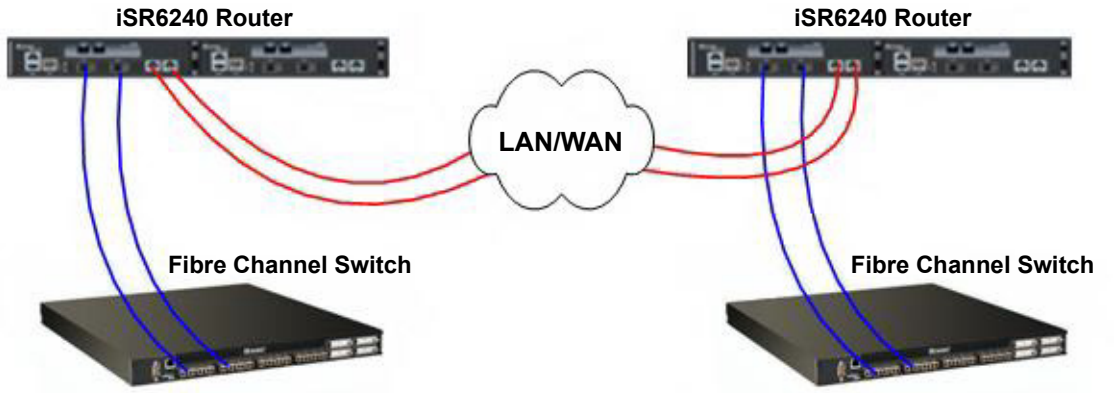


Figure 5-2. E_Port Extension, Dual ISLs

F_Port Extension

The FCIP configuration used to connect a distant F_Port to a SAN is referred to as an *F_Port extension*. This configuration is used to connect remote (stranded) servers to a SAN or to connect remote storage to a SAN. In the F_Port extension configuration, one of the FCIP routers (local) is connected to a Fibre Channel switch (SAN), and the other FCIP router (remote) is directly connected to a Fibre Channel port on the server or storage.

Figure 5-3 shows an example of F_Port extension used to connect a remote storage array.

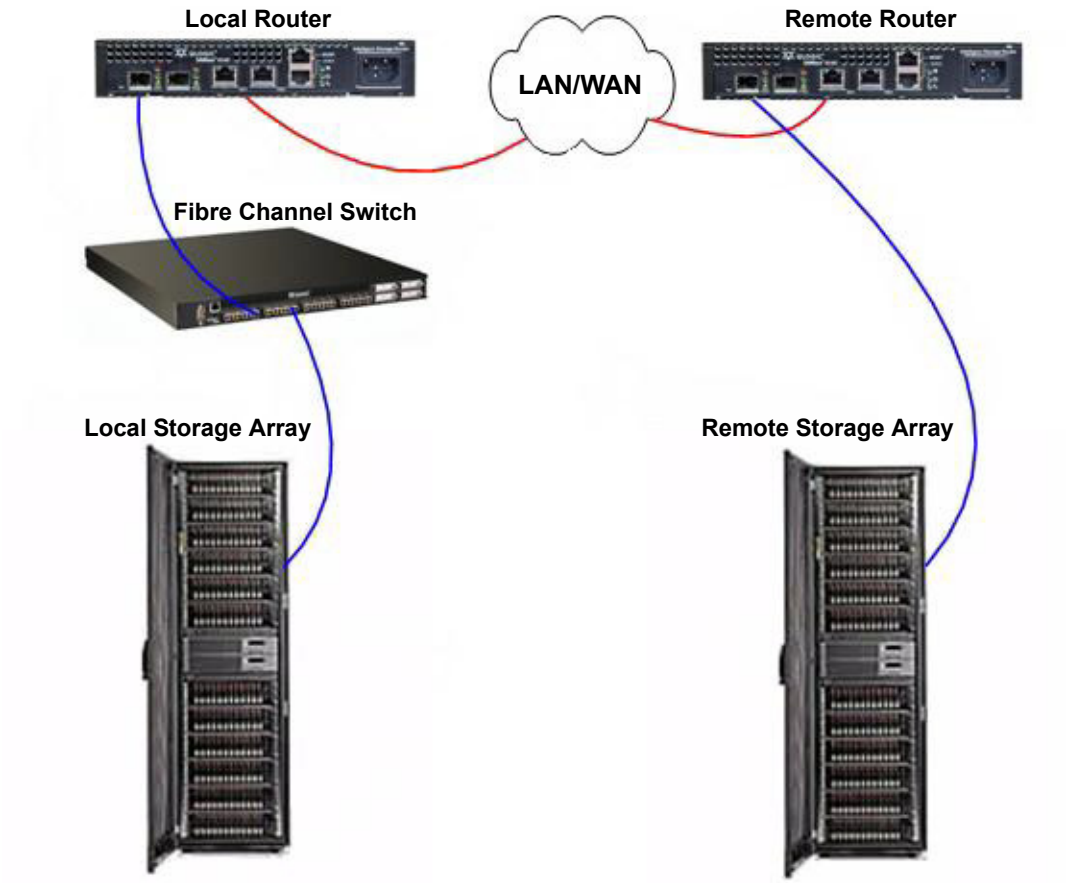


Figure 5-3. F_Port Extension, Remote Storage

Figure 5-4 shows an example of F_Port extension used to connect a remote (stranded) server.

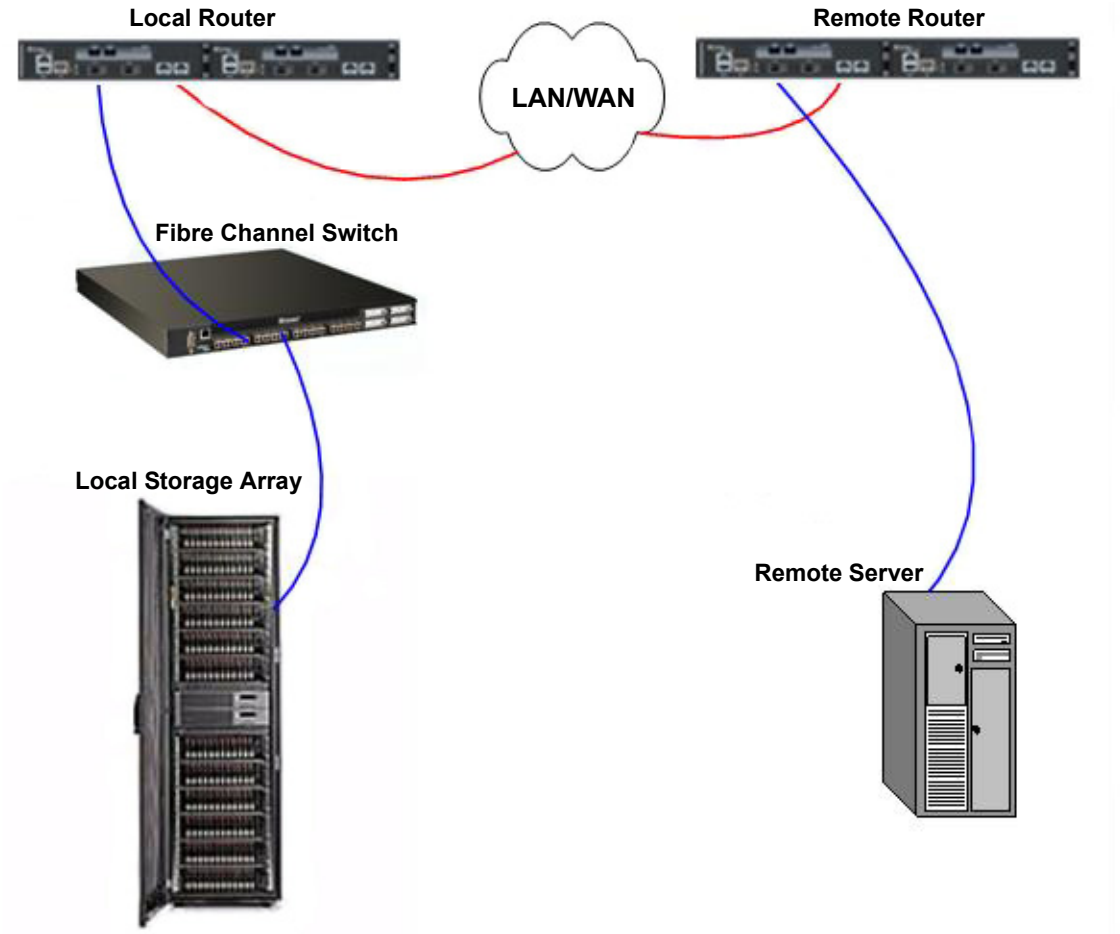


Figure 5-4. F_Port Extension, Server

Determining WAN Characteristics

To correctly configure an FCIP route for maximum performance and reliability requires precise understanding of the IP link (WAN) characteristics, including the following link characteristics:

- Link RTT
- Link data rate end-to-end:
  - Available link bandwidth
  - Allocated link bandwidth
- Link (WAN) quality: congestion (dropped packets) and packet errors

Round-Trip Time

RTT is the time required for a packet to travel from the sender to the receiver, and then return to the sender. The router's ping feature, either CLI or GUI, can help determine the RTT. The following is an example of the CLI `ping` command executed on GE port 1.

```
iSR6200 <1> (admin) #> ping
  A list of attributes with formatting and current values will follow.
  Enter a new value or simply press the ENTER key to accept the current value.
  If you wish to terminate this process before reaching the end of the list
  press 'q' or 'Q' and the ENTER key to do so.

  IP Address (IPv4 or IPv6)                 [0.0.0.0] 172.35.14.250
  Iteration Count (0=Continuously)          [0      ] 10
  Outbound Port (0=Mgmt, 1=GE1, 2=GE2, ...) [Mgmt   ] 1
  Size Of Packet (Min=1, Max=1472  Bytes)   [56     ]

  Pinging 172.35.14.250 with 56 bytes of data:

  Reply from 172.35.14.250: bytes=64 time=284.2ms
  Reply from 172.35.14.250: bytes=64 time=284.6ms
  Reply from 172.35.14.250: bytes=64 time=283.9ms
  Reply from 172.35.14.250: bytes=64 time=284.4ms
  Reply from 172.35.14.250: bytes=64 time=283.8ms
  Reply from 172.35.14.250: bytes=64 time=284.3ms
  Reply from 172.35.14.250: bytes=64 time=284.0ms
  Reply from 172.35.14.250: bytes=64 time=284.0ms
  Reply from 172.35.14.250: bytes=64 time=283.9ms
  Reply from 172.35.14.250: bytes=64 time=284.4ms

  Ping Statistics for 172.35.14.250:
      Packets:  Sent  = 10,  Received = 10, Lost = 0
  Approximate round trip times in milliseconds:
      Minimum = 283.8ms, Maximum = 284.6ms, Average = 284.1ms

iSR6200 <1> (admin) #>
```

Link Data Rate

The available link data rate is not typically the same as the connection speed at the router's GE port. The GE port is typically connected to a local IP switch with ports running at 1 gigabit. The provider of the long-distance connection (WAN) provides the link data rate. Table 5-2 lists some examples of data rates for commonly used WANs.

Table 5-2. WAN Data Rates

Link Type	Speed
T1 and DS-1	1.554Mbps
T3 and DS-3	45Mbps
OC-1	50Mbps
OC-3	150Mbps
DS-5	400Mbps
OC-12	621Mbps
OC-24	1.5Gbps

In some configurations, the data rate (bandwidth) supported by the WAN may not be dedicated to a single application such as FCIP. The ability to set the router's FCIP bandwidth usage provides for such configurations (see "Bandwidth Limiting" on page 5-15).

Link Quality

The link (WAN) quality can be difficult to determine; however, monitoring the router's statistics should provide an indication of the overall link quality. Typically, low link level errors are not seen at the router because they generally occur in the WAN.

The following TCP statistics are a useful indicator of WAN congestion or packet errors:

- **TCP Received Duplicate ACKs—**Receiving a duplicate ACK indicates that the receiver did not receive the packet following the ACK'd packet (packet whose sequence number follows the ACK'd packet). This is typically the result of the following:
  - Congestion: An IP switch or router somewhere in the WAN has dropped the packet due to its inability to transmit or buffer the packet.
  - Error: The packet was dropped somewhere in the WAN as a result of the detection of a data error (corruption).

- **TCP Retransmit Timer Expired—**The sender of a packet did not receive an ACK for a packet within the retransmit time-out window. The sender will retransmit the packet. This is typically the result of the ACK being dropped somewhere in the WAN due to congestion or corruption of the ACK (less likely).

The following example shows the FCIP link statistics from the router's CLI `show statistics` command. The `TCP Timer Expired` value consists of two counters:

- The upper 16 bits is a count of the number of retransmits resulting from receiving duplicate ACKs (count = **34** in the example).
- The lower 16 bits is a count of the number of retransmits resulting from retransmit time outs (count = **10** in the example).

```
FCIP Link Statistics
----------------------
FCIP Link                        1
FC Xmit Frames                   647245
FC Xmit Bytes                    1290829908
FC Rcvd Frames                   664413
FC Rcvd Bytes                    1276994796
IP Xmit Packets                  3747952
IP Xmit Byte Count               2849890416
IP Xmit Fragments                0
IP Rcvd Packets                  3649896
IP Rcvd Byte Count               2856931542
IP Rcvd Fragments                0
IP Datagram Reassembly Count     0
IP V6Pkt Rcvd                    34
IP Error Packets                 0
IP Reassembly Errors             0
TCP Xmit Segment Count           3747952
TCP Xmit Byte Count              2729955868
TCP Xmit Acks                    52598
TCP Rcvd Segment Count           3649888
TCP Rcvd Byte Count              2740134348
TCP Rcvd Acks                    37708
TCP Rcvd Window Probes           0
TCP Timer Expired                340010
TCP ECC Error Corrections         0
MAC Xmit Frames                  1890446
```

```
MAC Xmit Bytes                  1534059818
MAC Xmit Multi Count            6
MAC Xmit Broad Count            2
MAC Xmit Pause Count            0
MAC Xmit Control Frames         0
MAC Xmit Deferrals              0
MAC Xmit Late Collisions        0
MAC Xmit Aborted                0
MAC Xmit Multiple Collisions    0
MAC Xmit Single Collisions      0
MAC Xmit Collisions             0
MAC Xmit Dropped Frames         0
MAC Xmit Jumbo Frames           0
MAC Rcvd Frames                 1761672
MAC Rcvd Bytes                  1537825039
MAC Rcvd Multi Count            35
MAC Rcvd Broad Count            6
MAC Rcvd Pause Count            0
MAC Rcvd Control Frames         0
MAC Rcvd Dribbles               0
MAC Rcvd Frame Length Errors    0
MAC Rcvd Jabbers                0
MAC Rcvd Carrier Sense Errors   0
MAC Rcvd Dropped Frames         0
MAC Rcvd CRC Errors             0
MAC Rcvd Encoding Error         0
MAC Rcvd Length Errors          0
```

Firewall

When configuring an FCIP route in a WAN containing a firewall, the TCP and server ports used by the FCIP route must be unblocked. Table 5-3 lists the well-known ports and server ports that require unblocking in the firewall.

Table 5-3. Ports Requiring Unblocking

Port	Protocol	Description
20	TCP	FTP—data
21	TCP	FTP—control (command)
23	TCP	Telnet protocol—unencrypted text communications
111	TCP, UDP	Sun remote procedure call (RPC)
161	TCP, UDP	SNMP
835	TCP, UDP	Port number on which the server listens for user requests

To verify the listen port number, run the following command (from a Linux system), where the IP address specified is that of the remote router's management port:

`rpcinfo -p <`*`IP address`***`>`**

Look for the following program numbers:

Router	Program Number
iSR6142	351514
iSR6200	351515 351516 351517

The output of the `rpcinfo` command should be similar to the following. The numbers in the `Port #` column (`714`, `835`, and `896` in these examples) are the port number(s) that you need to unblock.

```
Program #            Port #
---------            ------
351517    1   udp    714
351517    1   tcp    714
351516    1   udp    714
351516    1   tcp    714
351514    1   udp    835
351514    1   tcp    835
351515    1   udp    896
351515    1   tcp    896
```

Data Compression

Data compression is an option that in some configurations can provide a data throughput rate greater than the capability of the IP link. The iSR6200 is capable of compressing data at rates up to 190Mbps. The iSR6200 can automatically enable or disable compression to achieve maximum throughput on a real-time basis, depending on the compressibility of the data and the configured bandwidth for the FCIP route. QLogic recommends that you always enable data compression and monitor the resulting performance to determine improvement. The FCIP route bandwidth must be correctly configured to realize the affects of automatic compression.

Bandwidth Limiting

The router provides the ability to set the maximum bandwidth used by an FCIP route. This setting is very important because most WANs do not support the 1-gigabit data rate of the router's GE ports. Bandwidth limiting is also needed for those configurations where the FCIP route is only allocated a portion of the total bandwidth.

NOTE

The bandwidth parameter should never be set higher than the total WAN bandwidth; otherwise, performance suffers due to WAN congestion (dropped packets).

When a configuration requires that the bandwidth available to the FCIP route be a percentage of the total WAN bandwidth, it is important to correctly calculate the bandwidth and set it accordingly. For instance if the FCIP route is being allocated 50 percent of an OC-3 link (150Mbps link), the route bandwidth setting should be as follows:

Bandwidth Allocated = 50% × Link Rate

75Mbps = 0.5 × 150Mbps

For more information, see "Configuring an FCIP Route Using the CLI" on page 5-3.

TCP Window Settings

The TCP window size defines the amount of data sent before seeing an acknowledgement. It is used to avoid overwhelming the receiver and still maintain a constant flow of data. The TCP window size is typically calculated based on the RTT and WAN speed.

The following tables show the suggested TCP window size settings for IP links based on link speed and RTT.

Table 5-4. T1 / DS-1—1.554Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	64K	1
100	32K	0
50	32K	0
25	32K	0
20	32K	0
15	32K	0
10	32K	0
5	32K	0
2.5	32K	0
1 or less	32K	0

Table 5-5. T3 / DS-3—45Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	1M	5
100	512K	4
50	256K	3
25	128K	2
20	128k	2
15	64K or 128K	1 or 2
10	64K	1
5	32K	0
2.5	32K	0
1 or less	32K	0

Table 5-6. DS-5—400Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	8M or 16M	8 or 9
100	4M	7
50	2M	6
25	1M	5
20	1M	5
15	1M	5
10	512K	4
5	256K	3
2.5	128K	2
1 or less	64K	1

Table 5-7. OC-1—50Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	1M or 2M	5 or 6
100	512K	4
50	256K	3
25	128K	2
20	128k	2
15	64K or 128K	1 or 2
10	64K	1
5	32K	0
2.5	32K	0
1 or less	32K	0

Table 5-8. OC-3—150Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	1M or 2M	5 or 6
100	1M or 2M	5 or 6
50	1M	5
25	512K	4
20	512K	4
15	256K	3
10	256K	3
5	128K	2
2.5	64K	1
1 or less	32K	0

Table 5-9. OC-3—150Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	4M	7
100	1M or 2M	5 or 6
50	1M	5
25	512K	4
20	512K	4
15	256K	3
10	256K	3
5	128K	2
2.5	64K	1
1 or less	32K	0

Table 5-10. OC-12 and Above—621Mbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	16M	9
100	8M	8
50	4M	7
25	2M	6
20	1M	5
15	1M	5
10	1M	5
5	512K	4
2.5	256K	3
1 or less	64K	1

Table 5-11. OC-24 and Above—1.244Gbps

Round-Trip Time (ms)	Window Size (bytes)	Scaling Factor (2^n)
250	16M	9
100	16M	9
50	8M	8
25	4M	7
20	2M or 4M	6 or 7
15	2M	6
10	2M	6
5	1M	5
2.5	512K	4
1 or less	128K	2

Router TCP Window Setup

Table 5-12 contains router settings for the listed TCP window sizes.

Table 5-12. Router TCP Window Settings

Required TCP Window Size (bytes)	Router TCP Window Size (bytes)	Router Window Scaling Factor (2^n)
8K	8,192	0
16K	16,384	0
32K	32,768	0
64K	32,768	1
128K	32,768	2
256K	32,768	3
512K	32,768	4
1M	32,768	5
2M	32,768	6
4M	32,768	7
8M	32,768	8
16M	32,768	9

6 Diagnostics and Troubleshooting

Diagnostic information about the router is available through the chassis LEDs and the port LEDs. Diagnostic information is also available through SANsurfer Router Manager and CLI event logs and error displays. This chapter describes the following types of diagnostics:

- Chassis Diagnostics
- “Power-On Self-Test Diagnostics” on page 6-2
- “LED Blink Patterns” on page 6-2

This chapter also describes how to use maintenance mode to recover a disabled router (see “Recovering a Router” on page 6-4).

Chassis Diagnostics

Figure 6-1 shows the chassis diagnostic LEDs, including the power LED and the system fault LED.

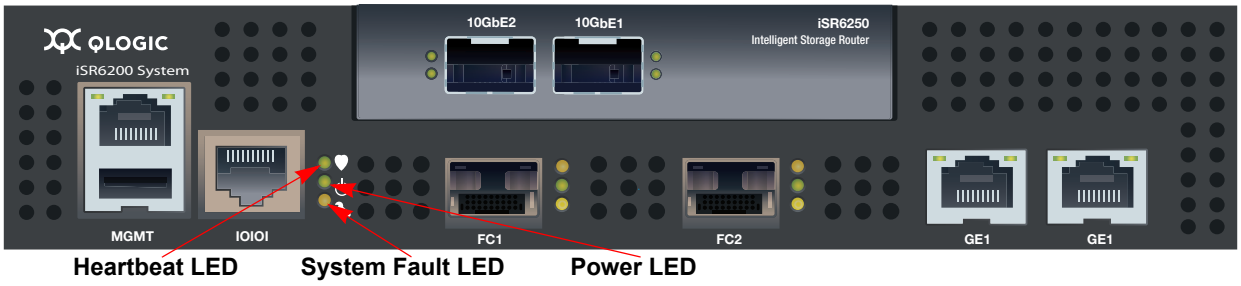


Figure 6-1. Router Blade Diagnostic LEDs

Input Power LED is Off

The input power LED lights up to show that the router logic circuitry is receiving proper voltages. If the input power LED is off, follow these steps:

- Inspect power cord and connectors. Is the cord unplugged? Is the cord or connector damaged?
  - **Yes**—Make necessary corrections or repairs. If the condition remains, continue.
  - **No**—Continue.
- Inspect AC power source. Is the power source delivering the proper voltage?
  - **Yes**—Continue.
  - **No**—Make the necessary repairs. If the condition remains, continue.
- Replace the router.

System Fault LED is On

The system fault LED blinks a specific pattern to indicate the problem. If the system fault LED lights up, take necessary actions (see “LED Blink Patterns” on page 6-2).

Power-On Self-Test Diagnostics

The router performs a series of tests as part of its power-on procedure. The POST diagnostic program performs the following tests:

- Memory
- FLASH validation
- PCI device discovery
- Management Ethernet port

LED Blink Patterns

The heartbeat and system fault LEDs show the operational status of the router. When the POST completes with no errors, these LEDs blink at a steady rate of once per second. When the router is in maintenance mode, the heartbeat and system fault LEDs are on continuously.

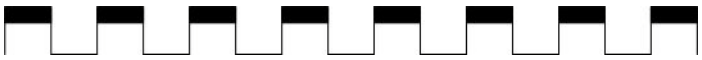
All other system fault blink patterns show critical errors. The heartbeat LED shows an error blink pattern for the conditions listed in Table 6-1.

Table 6-1. System Fault LED Blink Patterns

System Fault LED	Condition
OFF	Okay, operational
3 Blinks, followed by pause	System error
4 Blinks, followed by pause	Management port IP address conflict
5 Blinks, followed by pause	Over-temperature

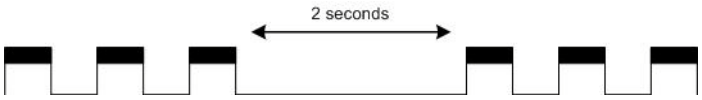
Heartbeat Blink Pattern

A blink pattern on the heartbeat LED of one second ON followed by one second OFF means that the router is operating normally. The heartbeat LED shows this pattern when the router firmware is operational.



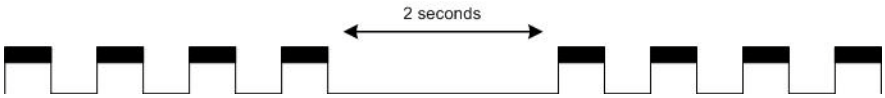
System Error Blink Pattern

The system fault LED generates a three-blink pattern (once per second) followed by a two-second pause to indicate a system error.



Management Port IP Address Conflict Blink Pattern

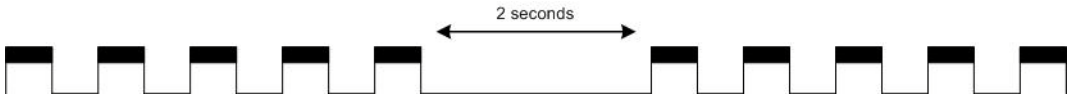
The system fault LED generates a four-blink pattern (once per second) followed by a two-second pause when the router detects an IP address conflict on the management Ethernet port.



You can clear the IP address conflict blinking using the CLI or SANsurfer Router Manager. Use the beacon OFF function.

Over-Temperature Blink Pattern

The system fault LED generates a five-blink pattern (once per second) followed by a two-second pause when the router is in an over-temperature condition. That is, the air temperature inside the router is over the failure temperature of 70°C (158°F).



If the system fault LED shows the over-temperature blink pattern, follow these steps:

- Inspect the chassis air vents. Are the intake and exhaust vents clear?
  - ❑ **Yes**—Continue.
  - ❑ **No**—Remove any debris from the fan intake and exhaust if necessary. If the condition remains, continue.
- Consider the ambient air temperature near the router and clearance around the router. Make necessary corrections. If the condition remains, open a command line window and log on to the router. Enter the `shutdown` command, and then power down the router. Contact your authorized maintenance provider.

Recovering a Router

You may have to recover a router for one of the following reasons:

- The password was changed and has been forgotten.
- The router's management IP address is unknown.

To recover the router's password, reset the password to the default by using the maintenance button (see page 1-10).

You can recover the router's IP address using either of the following methods:

- Connect to the serial console port (see page 1-15), and then use the CLI `set mgmt` command to reconfigure the management port (see the *iSR6200 Command Line Interface (CLI) User's Guide*).
- Use the maintenance button to reset the management port's IP to the factory default of 10.0.0.1 (see page 1-10).

7 Removal and Replacement

This chapter describes how to remove and replace the following FRUs:

- SFP Transceivers
- iSR6200 Chassis Blades
- “Power and Cooling Modules” on page 7-10

SFP Transceivers

You can remove and replace the SFP transceivers while the iSR6200 router is operating without damaging the router or the transceiver. However, this interrupts transmission on the affected port until you install the transceiver.

- To remove a transceiver, gently press the transceiver into the port to release the tension, pull the release tab or lever, and then remove the transceiver. Different transceiver manufacturers have different release mechanisms. Consult the documentation for your transceiver.
- To install a transceiver, insert it into the port and gently press until it snaps into place.

NOTE

The SFP transceiver fits only one way. If the SFP does not install under gentle pressure, flip it over and try again.

iSR6200 Chassis Blades

The iSR6200 router provides an enhanced feature you can use to replace any blade in the field. In a dual-blade chassis, the iSR6200 automatically restores a replacement blade’s configuration. When replacing a blade in a single-blade chassis, you can use the iSR6200 router’s management tools to save and restore a blade’s configuration.

The blade replacement feature ensures that the replaced unit retains the MAC addresses for the management ports and iSCSI ports, as well as the world wide port number (WWPN) and world wide node number (WWNN) for the Fibre Channel ports. Retaining these values ensures that the Fibre Channel zoning, LUN masking, and iSCSI login sessions previously established are still valid after replacing the blade. This feature retains the management IP address configuration across blade replacements.

Dual-Blade Installation

If the iSR6200 router chassis contains dual blades prior to replacing a specific blade, you do not need to use the management tool's Save and Restore FRU features because the blade already mirrors the configuration of its peer blade. When you replace a blade, it automatically restores all the configuration data from the other blade.

The following sections show how to remove and replace a failed blade in a dual-blade chassis installation:

- "Removing the Failed Blade" on page 7-2
- "Installing the Replacement Blade" on page 7-3

Removing the Failed Blade

To remove a failed blade from an iSR6200 chassis with a dual blade:

1. Prior to replacing the iSR6200 router blade, log out all iSCSI initiators from the iSR6200 blade you are replacing.
2. Disconnect all cables from the iSR6200 blade you are replacing, including Fibre Channel, iSCSI, management, Ethernet, and serial cables (see Figure 7-1).

Figure 7-1. iSR6200 Router Blade with Cables Disconnected

3. Remove the old blade from the chassis. Figure 7-2 shows how to release the latch and pull down on the lever on the right side (1), and then pull straight back on the handle (2).

Figure 7-2. Removing the Chassis Blade

Installing the Replacement Blade

Before replacing a blade for a dual-blade router installation, you must first remove it (as described on page 7-2).

To install a replacement blade in an iSR6200 chassis with a dual blade:

1. Unlatch the lever on the new blade prior to inserting it into the chassis, as shown in Figure 7-3.

Figure 7-3. Unlatching the Lever on the New Blade

2. Insert the new blade into the chassis slot. Figure 7-4 shows how to push the blade straight into the chassis (1), and then seat the blade onto the chassis mid-plane by pushing up the right side lever and latching it into place (2). The blade powers on and boots up.

Figure 7-4. Inserting the New Blade into the Chassis Slot

3. Reconnect all cables to the new blade.

Single-Blade Installation

For a single-blade configuration, you must save the configuration of the original blade using the `fru save` command whenever the blade configuration changes. You can save the configuration of the blade on a server you can later access to use for the replacement blade. After physically replacing the blade, you can then use the `fru restore` command to restore the saved configuration to the replacement blade. This enables the replacement blade to retain all user-configured settings.

The following sections show how to remove and replace a failed blade in a single-blade chassis installation:

- “Removing the Failed Blade” on page 7-5
- “Installing the Replacement Blade” on page 7-7

Removing the Failed Blade

To remove a failed blade from an iSR6200 chassis with a single blade:

1. Prior to replacing the iSR6200 router blade, log out all iSCSI initiators from the iSR6200 blade you are replacing.
2. Save the blade's FRU using either SANsurfer Router Manager or the CLI `fru save` command. The following example shows how to perform this using CLI commands.

```
iSR6200 login: guest
Password: ****** (default is password)

*******************************************************
*                                                     *
*                      iSR6200                        *
*                                                     *
*******************************************************

iSR6200 #> blade 1
iSR6200 <1> #> admin start

  Password     :  ******

iSR6200 <1> (admin) #> fru save

FRU save completed. Configuration File is iSR6200_FRU.bin
Please use FTP to extract the file out from the System.
```

3. Use an FTP client to get the FRU file from the iSR6200 blade. For both the user name and password, enter **ftp**. Remember to issue the `bin` command before you issue the `get` command. For example:

```
ftp <your router IP>
Connected to <your router IP>
220 (vsFTPd 2.0.5)
User (<your router IP>:(none)): ftp
331 Please specify the password.
Password:ftp
230 Login successful.
ftp> bin
200 Switching to Binary mode.
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
iSR6200_FRU.bin
226 Directory send OK.
ftp: 17 bytes received in 0.00Seconds 17000.00Kbytes/sec.
ftp> get iSR6200_FRU.bin
200 PORT command successful. Consider using PASV.
150 Opening BINARY mode data connection for iSR6200_FRU.bin (20010 bytes).
226 File send OK.
ftp: 20010 bytes received in 0.00Seconds 20010000.00Kbytes/sec.
ftp> bye
221 Goodbye.
```

4. Disconnect all cables from the iSR6200 blade. This includes all Fibre Channel, Ethernet, and serial cables. You can leave the power cables connected. (See Figure 7-5.)

NOTE

After you have installed the new blade, you must access it. Use a computer with a TCP/IP interface capable of using Telnet to connect to the new blades default IP address of `10.0.0.1`. Make sure you have such a computer available before you remove your old blade, and that the computer has the FRU file on it you saved in step 3.

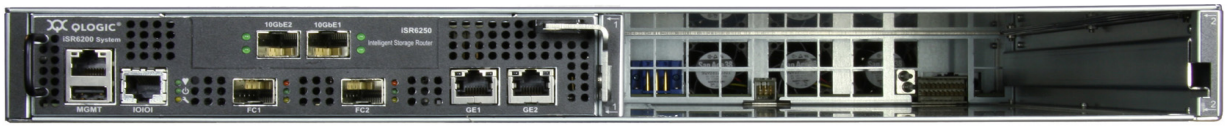


Figure 7-5. iSR6200 Router Blade with Cables Disconnected

5. Remove the old blade from the chassis. Figure 7-6 shows how to release the latch and pull down on the lever on the right side (1), and then pull straight back on the handle (2).

Figure 7-6. Removing the Chassis Blade

Installing the Replacement Blade

Before replacing a blade for a single-blade router installation, you must first remove it (as described on page 7-5).

To install a replacement blade in an iSR6200 chassis with a single blade:

1. Unlatch the lever on the new blade prior to inserting it into the chassis, as shown in Figure 7-7.

Figure 7-7. Unlatching the Lever on the New Blade

2. Insert the new blade into the chassis slot. Figure 7-8 shows how to push the blade straight into the chassis (1), seat the blade onto the chassis mid-plane by pushing the right side lever up, and then latching it into place (2). The blade powers on and boots up.

Figure 7-8. Inserting the New Blade into the Chassis Slot

3. Wait until the blade finishes booting up.

The system runs the POST. The heartbeat and system fault LEDs show the operational status of the router. When the POST completes with no errors, these LEDs blink at a steady rate of once per second.

4. Connect to the blade's Ethernet management interface to your computer.
5. Open a command line, change to the directory that contains your FRU file, and then enter **`ftp 10.0.0.1`**. For both the user name and password, use **`ftp`**. Remember to enter the `bin` command before you enter the `put` command. For example:

```
>ftp 10.0.0.1
Connected to 10.0.0.1.
220 (vsFTPd 2.0.5)
User (10.0.0.1:(none)): ftp
331 Please specify the password.
Password: ftp
230 Login successful.
ftp> bin
200 Switching to Binary mode.
ftp> put iSR6200_FRU.bin
200 PORT command successful. Consider using PASV.
150 Ok to send data.
226 File receive OK.
ftp: 20010 bytes sent in 0.00Seconds 20010000.00Kbytes/sec.
ftp> bye
221 Goodbye.

10:  Telnet to 10.0.0.1, and run the 'fru restore' command.

iSR6200 login: guest
Password: ****** (default is password)

       ******************************************************
       *                                                    *
       *                       iSR6200                      *
       *                                                    *
       ******************************************************

iSR6200 #> blade 1

iSR6200 <1> #> admin start

Password     :  ******
```

```
iSR6200 <1> (admin) #> fru restore

  A list of attributes with formatting and current values will follow.
  Enter a new value or simply press the ENTER key to accept the current value.
  If you wish to terminate this process before reaching the end of the list
  press 'q' or 'Q' and the ENTER key to do so.

  Type of restore (0=full, 1=mappings only)  [full] 0

  FRU restore completed.
  Please reboot the system for configuration to take affect.

iSR6200 <1> (admin) #> reboot

  Are you sure you want to reboot the System (y/n):  y
  System will now be rebooted...

iSR6200 #>

Connection to host lost.
```

The replacement blade should now be operational.

Power and Cooling Modules

Each iSR6200 chassis blade has a PCM, located on the back side of the chassis. Each PCM consists of one power supply, three fans, and one external status LED.

The PCM's external status LED shows its status:

- Green = GOOD status, indicating that the PCM is running as expected.
- Amber = FAULT status, indicating that the PCM has failed.

You can remove and replace a failed PCM as described in the following sections:

- "Removing the Failed PCM" on page 7-11
- "Installing the Replacement PCM" on page 7-12

Removing the Failed PCM

To remove a failed PCM from the iSR6200 chassis:

1. Locate the failed PCM unit on the back side of the iSR6200 chassis. A failed PCM unit shows an amber colored status LED.

   Figure 7-9 shows the back side of two PCMs installed in a chassis configured with two iSR6200 chassis blades. The PCM on the left side shows its fault indicator in amber, which indicates a FAULT status. The PCM on the right side shows its fault indicator in green, which indicates a GOOD status.

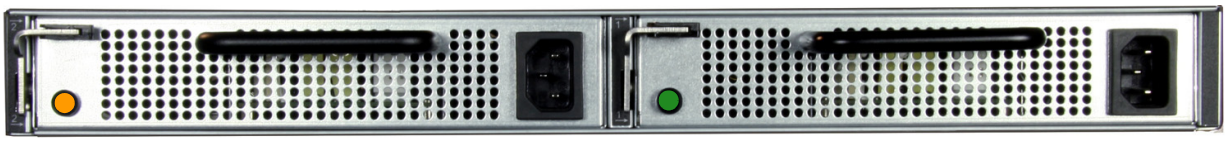


Figure 7-9. Back Side of Two PCMs with Fault (left) and Good (right) Status Indicators

2. Check the second (GOOD) PCM to make sure it is ready to support storage connectivity while you are replacing the failed PCM unit. Make sure the second PCM's power cable is connected to the cable with the other end plugged into a live power source, and that it shows a green status LED.

CAUTION

Failure to verify the functionality of the second PCM can result in lost host storage connectivity.

3. Remove the power cable from the failed PCM unit. The LED remains amber even after the removing the power cable.
4. Release the chassis latch on the left side of the unplugged PCM. As shown in Figure 7-10, pull down on the lever to unseat the PCM (1), and then remove the PCM by pulling straight back on the handle (2).

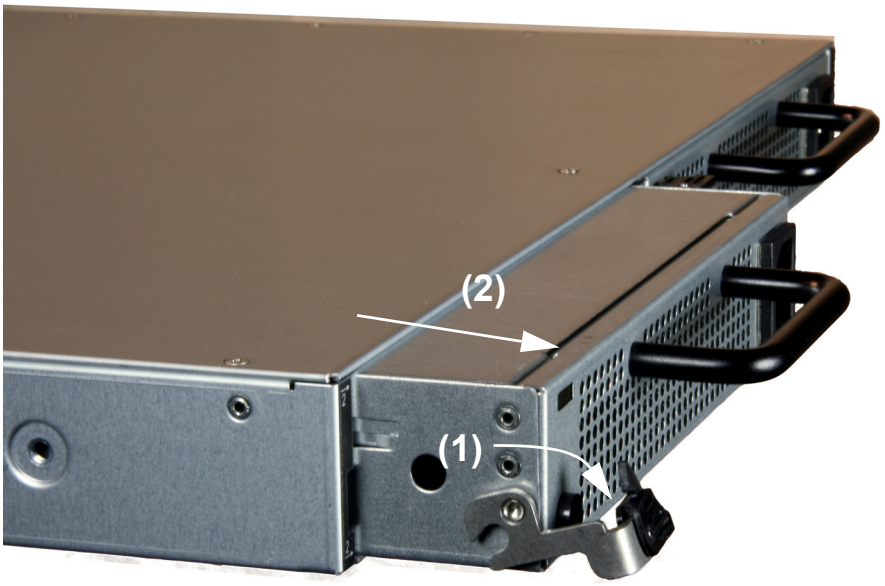


Figure 7-10. Removing the Failed PCM

Installing the Replacement PCM

To install a replacement PCM in the iSR6200 chassis:

1. Before you insert the new PCM into the chassis, unlatch the lever on the new PCM (see Figure 7-11.)

Figure 7-11. Unlatching Lever on New PCM

2. Insert the replacement PCM into the iSR6200 chassis. As shown in Figure 7-10, push the PCM straight into the chassis (1), and then make sure the PCM is properly seated into the chassis mid-plane by pushing the lever up and locking the latch in the up position (2). The PCM fans turn on and the LED should show an amber color.

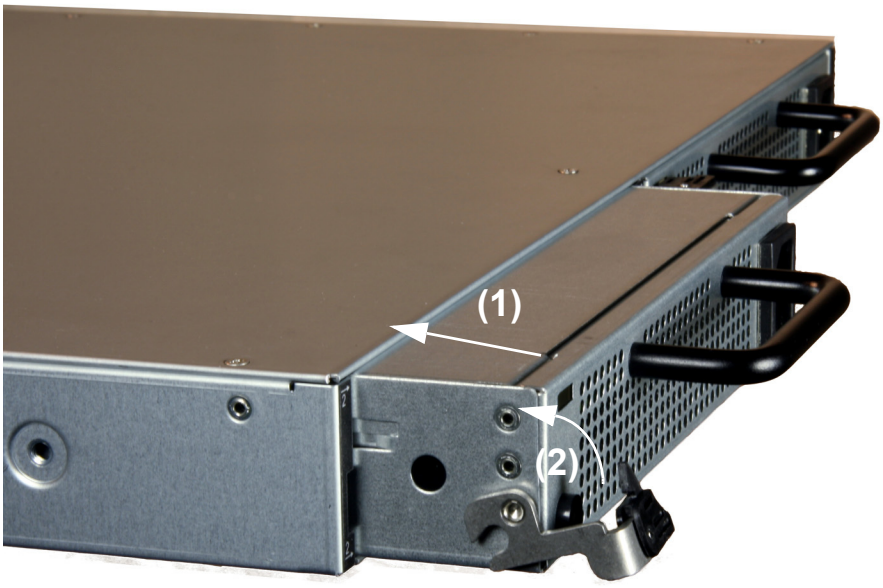


Figure 7-12. Inserting the Replacement PCM

3. Connect the power cable to the newly inserted PCM. Its status LED color should change from amber to green within five seconds.

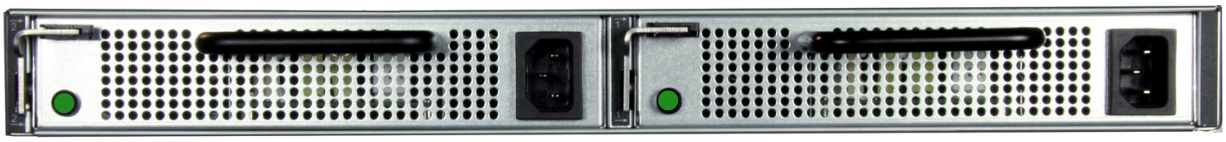


Figure 7-13. Back Side of Two PCMs, Both With Good Status Indicators

4. Verify that the airflow through both PCMs is in the same direction.

A Technical Specifications

This appendix provides the following technical specification for the iSR6200 router:

- Interface Specifications
- “Expansion Configurations” on page A-2
- “Performance Features” on page A-2
- “iSCSI Initiator Support” on page A-3
- “Device Management” on page A-3
- “Mechanical” on page A-3
- “High Availability” on page A-4
- “Protocols” on page A-4
- “Protocols” on page A-4
- “Environmental and Safety” on page A-4

Interface Specifications

The iSR6200 router can support one or two installed blades. The following interfaces apply to each router blade.

- **Gigabit Ethernet:**
  - Two ports: copper 1000 Base-T, RJ45
  - Full duplex, auto negotiating 100Mbps or 1000Mbps
- **Fibre Channel:**
  - Two optical ports, full duplex
  - Auto negotiation: 8, 4, or 2Gbps
  - N_Ports, NL_Ports, F_Ports, FL_Ports
  - Class 2, 3 connection-less

- **Management Ports:**
  - Ethernet 10 or 100 Base-T with RJ45
  - RS-232 serial port with RJ45

Expansion Configurations

One expansion card per router blade can add one of the following optional port configurations to the system:

- Two 1Gb Ethernet modules
- Two 10Gb Ethernet FCoE or iSCSI modules (standard configuration)
- Two 8Gb Fibre Channel ports

Performance Features

- **Maximum Data Rates:**
  - iSCSI: 2.6Gbps aggregate (1.3Gbps per blade)
  - Fibre Channel: 12.8Gbps aggregate (6.4Gbps per blade)
- **Input/output Operations per Second (IOPS):**
  - 200K IOPS aggregate (100K per blade)
- **VLAN Support:**
  - Up to two VLANs per GbE port (one for IPv4 and one for IPv6)
- **ISCSI Host Support:**
  - 2,048 iSCSI hosts (1,024 per router blade)
- **WAN Device Support:**
  - 252 WWNNs (63 per Fibre Channel port)
  - Simultaneous target and initiator mode for Fibre Channel ports
- **Supported SFP Types:**
  - Shortwave (optical)
  - Longwave (optical)
- **Interoperability:**
  - Compatible with FC-SW-2 complaint switches
  - Management interoperability with leading SAN management utilities

iSCSI Initiator Support

- **Microsoft:** Windows 2000, 2003, and 2008
- **Solaris:** SPARC 2.6, 8, 9, 10: X86
- **Linux:** Red Hat AS 3, 4, 5; SUSE Enterprise Server 8, 9, 10
- **VMware:** ESX Server v3.0.x, v3.5x
- **AIX:** AIXL 5
- **HP-UX:** versions 9, 10
- **QLogic iSCSI adapters:** QLA4010, QLA4050, QLA4052, QLE4060, and QLE4062
- **Apple:** Mac OS X (via the ATTO® driver)

Device Management

- **Management Methods:**
  - Wizard-based configuration tools
  - Command line interface (CLI)
  - SNMP and SMI-S
- **Access Methods:**
  - Dedicated out-of-band Ethernet 10 and 100 Base-T, RJ45, and RS-232 serial port
- **Diagnostics**:
  - POST of all functions except media modules
- **User Interface:**
  - LED front panel indicators, CLI, and browser utilities

Mechanical

- **Enclosure Type:**
  - 1U, full rack width, mounting rails included
- **Dimensions**:
  - Width: 431.8mm (17.0 inches)
  - Height: 43.7mm (1.72 inches)
  - Depth: 631.4mm (24.9 inches)

- **Power Supply:**
  - 235W maximum (two blades and two expansion cards)
  - 106W typical (one blade and two power modules)
  - 100V AC to 240V AC; 50Hz to 60Hz
  - 1.9A at 100–125V AC; 1.02A at 200–240V AC
  - Dual, redundant, hot-swap power supplies
- **Cooling:**
  - Six redundant fans with back-to-front airflow

High Availability

High availability (HA) specifications include the following:

- Hot-swap router blades and power supplies
- Router blade persistence: all zoning and addressing maintained in non-volatile memory.
- Fan modules powered by both power supplies.

Protocols

Supported protocols include the following:

- iSCSI to FCP
- FCIP
- CHAP security and authentication
- IPv6 and IPv4

Environmental and Safety

Environmental and safety specifications include the following:

- **Operating:**
  - Temperature: +5°C to +40°C (41°F to 104°F)
  - Humidity: 5 percent to 90 percent non-condensing
  - Altitude: 0 to 10,000 feet
  - Vibration: IEC 68-2, 5–500Hz, random, 0.21G rms, 10 minutes
  - Shock: IEC 68-2, 4g, 11ms, 20 repetitions

- **Non-operating:**
  - Temperature: -40°C to +70°C (-40°F to158°F)
  - Humidity: 5 percent to 93 percent non-condensing
  - Altitude: 0 to 50,000 feet
  - Vibration: IEC 68-2, 5–500Hz, random, 2.09G rms, 10 minutes
  - Shock: IEC 68-3, 30g, 292ips, 3 repetitions, 3 axis

B Simple Network Management Protocol

Simple network management protocol (SNMP) provides monitoring and trap functions for managing the router through third-party applications that support SNMP. The router firmware supports SNMP versions 1 and 2 and a QLogic management information base (MIB) (see page B-3). You may format traps using SNMP version 1 or 2.

This appendix provides the following SNMP information for the iSR6200:

- "SNMP Parameters" on page B-2
- "SNMP Trap Configuration" on page B-3
- "Management Information Base (MIB)" on page B-3
- "Notifications" on page B-18

SNMP Parameters

You can set the SNMP properties using SANsurfer Router Manager or the CLI. For SNMP configuration details, see the *iSR6200 Router Manager User's Guide* or the *iSR6200 Command Line Interface (CLI) User's Guide*.

Table B-1 describes the SNMP parameters.

Table B-1. SNMP Parameters

Parameter	Description
`Read community`	A password that authorizes an SNMP management server to read information from the router. This is a write-only field. The value on the router and the SNMP management server must be the same. The read community password can be up to 32 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is password is *private*.
`Trap community`	A password that authorizes an SNMP management server to receive traps. This is a write-only field. The value on the router and the SNMP management server must be the same. The trap community password can be up to 32 characters, excluding the number sign (#), semicolon (;), and comma (,). The default password is *private*.
`System location`	Specifies the name of the router location. The name can be up to 64 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is undefined.
`System contact`	Specifies the name of the person to be contacted to respond to trap events. The name can be up to 64 characters, excluding the number sign (#), semicolon (;), and comma (,). The default is undefined.
`Authentication traps`	Enables or disables the generation of authentication traps in response to authentication failures. The default is *disabled*.

SNMP Trap Configuration

SNMP trap configuration lets you set up to eight trap destinations. Choose from Traps 1–Trap 8 to configure each trap. Table B-2 describes the parameters for configuring an SNMP trap.

Table B-2. SNMP Trap Configuration Parameters

Parameter	Description
`Trap n enabled`	Enables or disables trap *n*. If disabled, the trap is not configured.
`Trap address`*	Specifies the IP address to which the SNMP traps are sent. A maximum of eight trap addresses are supported. The default address for traps is `0.0.0.0`.
`Trap port`*	Port number on which the trap is sent. The default is `162`. If the trap destination is not enabled, this value is `0` (zero). Most SNMP managers and management software listen on this port for SNMP traps.
`Trap version`	Specifies the SNMP version (`1` or `2`) with which to format traps.

Table Note

* Trap address (other than `0.0.0.0`.) and trap port combinations must be unique. For example, if trap 1 and trap 2 have the same address, they must have different port values. Similarly, if trap 1 and trap 2 have the same port value, they must have different addresses.

Management Information Base (MIB)

This section describes the QLogic management information base (MIB). The MIB includes the following tables:

- “Network Port Table” on page B-4
- “FC Port Table” on page B-7
- “Initiator Object Table” on page B-9
- “LUN Table” on page B-12
- “VP Group Table” on page B-14
- “Sensor Table” on page B-16

Network Port Table

The network port table contains a list of network ports that are operational on the router. The entries in this table include the management port (labeled MGMT), and the gigabit Ethernet ports (labeled GE1 and GE2).

qsrNwPortTable

Syntax `SEQUENCE OF QsrNwPortEntry`

Access Not accessible

Description Entries in this table include the management port, and the iSCSI ports on the router.

qsrNwPortEntry

Syntax `QsrNwPortEntry`

Access Not accessible

Description Each entry (row) contains information about a specific network port.

A network port entry consists of the following sequence of objects:

```
qsrNwPortRole          QsrPortRole
qsrNwPortIndex         unsigned32
qsrNwPortAddressMode   INTEGER
qsrIPAddressType       InetAddressType
qsrIPAddress           InetAddress
qsrNetMask             InetAddress
qsrGateway             InetAddress
qsrMacAddress          MacAddress
qsrNwLinkStatus        QsrLinkStatus
qsrNwLinkRate          QsrLinkRate
```

qsrNwPortRole

Syntax `QsrPortRole`

Access Not accessible

Description Operational role of this port: management port or iSCSI port.

qsrNwPortIndex

Syntax `Unsigned32`

Access Not accessible

Description A positive integer indexing each network port in a specific role.

qsrNwPortAddressMode

Syntax `INTEGER`
`1` = Static
`2` = DHCP
`3` = Bootp
`4` = RARP

Access Read-only

Description Method by which the port gets its IP address.

qsrIPAddressType

Syntax `InetAddressType`

Access Read-only

Description IP address type: `ipv4` or `ipv6`.

qsrIPAddress

Syntax `InetAddress`

Access Read-only

Description IP address of the port.

qsrNetMask

Syntax `InetAddress`

Access Read-only

Description Subnet mask for this port.

qsrGateway

Syntax `InetAddress`

Access Read-only

Description Gateway for this port.

qsrMacAddress

Syntax `IMacAddress`

Access Read-only

Description MAC address for this port.

qstNwLinkStatus

Syntax `QsrLinkStatus`

Access Read-only

Description Operational link status for this port.

qsrNwLinkRate

Syntax `QsrLinkRate`

Access Read-only

Description Operational link rate for this port.

FC Port Table

This table contains a list of the Fibre Channel (FC) ports on the router. There are as many entries in this table as there are Fibre Channel ports on the router.

qsrFcPortTable

Syntax `SEQUENCE OF QsrFcPortEntry`

Access Not accessible

Description A list of the Fibre Channel ports on the router.The table contains as many entries as there are Fibre Channel ports on the router.

qsrFcPortEntry

Syntax `QsrFcPortEntry`

Access Not accessible

Description Each entry (row) contains information about a specific Fibre Channel port.

A Fibre Channel port entry consists of the following sequence of objects

```
qsrFcPortRole      QsrPortRole
qsrFcPortIndex     Unsigned32
qsrFcPortNodeWwn   PhysAddress
qsrFcPortWwn       PhysAddress
qsrFcPortId        PhysAddress
qsrFcPortType      Unsigned32
qsrFcLinkStatus    QsrLinkStatus
qsrFcLinkRate      QsrLinkRate
```

qsrFcPortRole

Syntax `QsrPortRole`

Access Not accessible

Description Operational role of this port: FCP mode or frame shuttle mode.

qsrFcPortIndex

Syntax `Unsigned32`

Access Not accessible

Description A positive integer indexing each Fibre Channel port in a specific role.

qsrFcPortNodeWwn

Syntax `PhysAddress`

Access Read-only

Description World wide name of the node that contains this port.

qsrFcPortWwn

Syntax `PhysAddress`

Access Read-only

Description World wide name for this port.

qsrFcPortId

Syntax `PhysAddress`

Access Read-only

Description Interface's 24-bit Fibre Channel address identifier.

qsrFcPortType

Syntax `Unsigned32`

Access Read-only

Description Type of Fibre Channel port, as indicated by the use of the appropriate value assigned by the Internet Assigned Numbers Authority (IANA). The IANA-maintained registry for Fibre Channel port types is located here:

www.iana.org/assignments/fc-port-types

qsrFcLinkStatus

Syntax `QsrLinkStatus`

Access Read-only

Description Current link status for this port.

qsrFcLinkRate

Syntax `QsrLinkRate`

Access Read-only

Description Current link rate for this port.

Initiator Object Table

The initiator object table is a list of the iSCSI initiators that have been discovered by the router. There are as many entries in this table as there are iSCSI initiators on the router.

qsrIsInitTable

Syntax `SEQUENCE OF QsrIsInitEntry`

Access Not accessible

Description Entries in this table contain information about initiators.

qsrIsInitEntry

Syntax `QsrIsInitEntry`

Access Not accessible

Description Each entry (row) contains information about a specific iSCSI initiator.

iSCSI initiator information entry consists of the following sequence of the object:

```
qsrIsInitIndex       Unsigned32,
qsrIsInitName        SnmpAdminString,
qsrIsInitAlias       SnmpAdminString,
qsrIsInitAddressType InetAddressType,
qsrIsInitAddress     InetAddress,
qsrIsInitStatus      INTEGER,
qsrIsInitOsType      SnmpAdminString,
qsrIsInitChapEnabled INTEGER
```

qsrIsInitIndex

Syntax `Unsigned32`

Access Not accessible

Description An arbitrary positive integer denoting each iSCSI initiator discovered by the router.

qsrIsInitName OBJECT-TYPE

Syntax `SnmpAdminString`

Access Not accessible

Description iSCSI name of the initiator.

qsrIsInitAlias OBJECT-TYPE

Syntax `SnmpAdminString`

Access Read-only

Description Alias for the iSCSI initiator.

qsrIsInitAddressType

Syntax `InetAddressType`

Access Read-only

Description Type of iSCSI initiator's IP address (IPv4 or IPv6).

qsrIsInitAddress

Syntax `InetAddress`

Access Read-only

Description IP address of the iSCSI initiator.

qsrIsInitStatus

Syntax `Integer:`
`1` = unknown,
`2` = loggedIn,
`3` = loggedOut,
`4` = recovery

Access Read-only

Description Status of the iSCSI initiator; that is, whether or not it is logged into the router.

qsrIsInitOsType

Syntax `SnmpAdminString`

Access Read-only

Description The type of the iSCSI initiator's operating system.

qsrIsInitChapEnabled

Syntax `Integer: 0` = enabled; `2` = disabled

Access Read-only

Description A value indicating whether CHAP is enabled or not for this iSCSI initiator.

LUN Table

These tables contains information about the logical unit number (LUN) list.

qsrLunTable

Syntax `SEQUENCE OF QsrLunEntry`

Access Not accessible

Description A list of the LUNs on the Fibre Channel targets discovered by the router. There are as many entries in this table as there are Fibre Channel targets on the router.

qsrLunEntry

Syntax `QsrLunEntry`

Access Not accessible

Description Each entry (row) contains information about a specific LUN.This table extends `scsiDscLunTable` in `QLOGIC-SCSI-MIB`. The entries in this table show other attributes of the LUN.

The `QsrLunEntry` consists of the following sequences of objects.

```
qsrLunWwuln          PhysAddress,
qsrLunVendorId       SnmpAdminString,
qsrLunProductId      SnmpAdminString,
qsrLunProdRevLevel   SnmpAdminString,
qsrLunSize           Unsigned32,
qsrLunState          INTEGER,
qsrLunVPGroupid      INTEGER,
qsrLunVPGroupname    SnmpAdminString
```

qsrLunWwuln

Syntax `PhysAddress`

Access Read-only

Description The worldwide unique LUN name (WWULN) for the LUN.

qsrLunVendorId

Syntax `SnmpAdminString`

Access Read-only

Description Vendor ID for the LUN.

qsrLunProductId

Syntax `SnmpAdminString`

Access Read-only

Description Product ID for the LUN.

qsrLunProdRevLevel

Syntax `SnmpAdminString`

Access Read-only

Description Product revision level for the LUN.

qsrLunSize OBJECT-TYPE

Syntax `Unsigned32`

Units Megabytes

Access Read-only

Description Size of the LUN (in megabytes).

qsrLunState

Syntax `Integer`
`1` = online,
`2` = offline,
`3` = reserved

Access Read-only

Description State of the LUN (online or offline).

qsrLunVPGroupid

Syntax `Integer`

Access Read-only

Description ID of the VP group to which this LUN belongs.

qsrLunVPGroupname OBJECT-TYPE

Syntax `SnmpAdminString`

Access Read-only

Description VP group name to which this LUN belongs.

VP Group Table

This table contains a list of virtual port groups (VPGs). There are four entries in this table at any point of time.

qsrVPGroupTable

Syntax `SEQUENCE OF QsrVPGroupEntry`

Access Not accessible

Description Table for the VP group.

qsrVPGroupEntry OBJECT-TYPE

Syntax `QsrVPGroupEntry`

Access Not accessible

Description Each entry in the VP group table.

Index

```
{ qsrVPGroupIndex }
::= { qsrVPGroupTable 1 }
```

The `QsrVPGroupEntry` contains the following sequence of objects:

```
qsrVPGroupIndex     Unsigned32,
qsrVPGroupId        INTEGER,
qsrVPGroupName      SnmpAdminString,
qsrVPGroupWWNN      VpGroupWwnnAndWwpn,
qsrVPGroupWWPN      VpGroupWwnnAndWwpn,
qsrVPGroupStatus    INTEGER
```

qsrVPGroupIndex OBJECT-TYPE

Syntax `Unsigned32`

Access Read-only

Description VP group index.

qsrVPGroupId OBJECT-TYPE

Syntax `Integer`

Access Read-only

Description VP group ID.

qsrVPGroupName

Syntax `SnmpAdminString`

Access Read-only

Description VP group name or host group name.

qsrVPGroupWWNN

Syntax `VpGroupWwnnAndWwpn`

Access Read-only

Description Worldwide node name (WWNN) for VP group.

qsrVPGroupWWPN OBJECT-TYPE

Syntax `VpGroupWwnnAndWwpn`

Access Read-only

Description Worldwide port number (WWPN).

qsrVPGroupStatus OBJECT-TYPE

Syntax `Integer`: `0` = enabled; `1` = disabled

Max-Access Read-only

Description Maintain the status of the VP group (enabled or disabled)

Sensor Table

The sensor table lists all the sensors on the router. Each table row specifies a single sensor.

qsrSensorTable

Syntax `SEQUENCE OF QsrSensorEntry`

Access Not accessible

Description List of all the sensors on the router. The table contains as many entries (rows) as there are sensors.

qsrSensorEntry

Syntax `QsrSensorEntry`

Access Not accessible

Description Each entry (row) corresponds to a single sensor.

A sensor entry consists of the following sequence of objects:

`qsrSensorType`	`INTEGER`
`qsrSensorIndex`	`Unsigned32`
`qsrSensorUnits`	`INTEGER`
`qsrSensorValue`	`Integer32`
`qsrUpperThreshold`	`Integer32`
`qsrLowerThreshold`	`Integer32`
`qsrSensorState`	`INTEGER`

qsrSensorType

Syntax `INTEGER`
Temperature = `1`

Access Not accessible

Description Type of data being measured by this sensor.

qsrSensorIndex

Syntax `Unsigned32`

Access Not accessible

Description A positive integer identifying each sensor of a specific type.

qsrSensorUnits

Syntax `INTEGER`
Celsius = `1`

Access Read-only

Description Unit of measurement for the sensor.

qsrSensorValue

Syntax `Integer32`

Access Read-only

Description Current value of the sensor.

qsrUpperThreshold

Syntax `Integer32`

Access Read-only

Description Upper-level threshold for this sensor.

qsrLowerThreshold

Syntax `Integer32`

Access Read-only

Description Lower-level threshold for this sensor.

qsrSensorState

Syntax	`INTEGER`
Access	Read-only
Description	State of this sensor, indicating the health of the system: `Unknown` = The sensor value/thresholds cannot be determined. `Normal` = The sensor value is within normal operational limits. `Warning` = The sensor value is approaching a threshold. `Critical` = The sensor value has crossed a threshold.

Notifications

The router provides the following notification types described in this section:

- “System Information Objects” on page B-18
- “Notification Objects” on page B-20
- “Agent Startup Notification” on page B-20)
- “Agent Shutdown Notification” on page B-20
- “Network Port Down Notification” on page B-21
- “FC Port Down Notification” on page B-21
- “Target Device Discovery” on page B-21
- “Target Presentation (Mapping)” on page B-22
- “VP Group Notification” on page B-22
- “Sensor Notification” on page B-22
- “Generic Notification” on page B-24

NOTE

Every notification uses `qsrBladeSlot` as one of the objects. This determines the originator blade for the same notification.

System Information Objects

The system information objects provide the system serial number, version numbers (hardware, software, and agent), and number of ports (Fibre Channel and GbE).

qsrSerialNumber

Syntax `SnmpAdminString`

Access Read-only

Description System serial number.

qsrHwVersion

Syntax `SnmpAdminString`

Access Read-only

Description System hardware version number.

qsrSwVersion

Syntax `SnmpAdminString`

Access Read-only

Description System software (firmware) version number.

qsrNoOfFcPorts

Syntax `Unsigned32`

Access Read-only

Description Quantity of Fibre Channel ports on the system.

qsrNoOfGbEPorts

Syntax `Unsigned32`

Access Read-only

Description Quantity of GbE ports on the system.

qsrAgentVersion

Syntax `SnmpAdminString`

Access Read-only

Description Version number of the agent software on the system.

Notification Objects

This section defines the objects used in notifications.

qsrEventSeverity

Syntax	`INTEGER`
Access	Accessible for notify
Description	Indicates the severity of the event. The value *clear* specifies that a condition that caused an earlier trap is no longer present.

qsrEventDescription

Syntax	`SnmpAdminString`
Access	Accessible for notify
Description	A text description of the event that occurred.

qsrEventTimeStamp

Syntax	`DateAndTime`
Access	Accessible for notify
Description	Indicates when the event occurred.

Agent Startup Notification

The agent startup notification indicates that the agent on the router has started running.

`qsrAgentStartup` uses the following object:

- `qsrEventTimeStamp`

Agent Shutdown Notification

The agent shutdown notification indicates that the agent on the router is shutting down.

`qsrAgentShutdown` uses the following object:

- `qsrEventTimeStamp`

Network Port Down Notification

The network port down notification indicates that the specified network port is **`down`**. The next time the port comes up, this event is sent with the `qsrEventSeverity` object set to **`clear`**.

`qsrNwPortDown` uses the following objects:

- `qsrNwLinkStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

Network notifications are sent for the following events:

- Management port: down or up
- iSCSI port: down or up
- Port number (1–4)

FC Port Down Notification

The FC port down notification indicates that the specified Fibre Channel port is `down`. The next time the port comes up, this event is sent with the `qsrEventSeverity` object set to `clear`.

`qsrFcPortDown` uses the following objects:

- `qsrFcLinkStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

FC notifications are sent for the following events:

- Fibre Channel port: down or up
- Port number (1–4)

Target Device Discovery

The Fibre Channel target device discovery notification indicates that the specified Fibre Channel target is online or offline.

`qsrDscTgtStatusChanged` uses the following objects:

- `qsrBladeSlot`
- `qsrEventTimeStamp`
- `qsrFcTgtState`
- `qsrEventSeverity`

Fibre Channel target device discovery notifications are sent for the following event:

- Fibre Channel Target
  - State: Discovered, went offline, or went online

- Target WWPN
- Blade number (1 or 2)

Target Presentation (Mapping)

The target presentation notification indicates that the specified target has been presented (mapped) or unpresented (unmapped).

`qsrPresTgtMapped` uses the following objects:

- `qsrBladeSlot`
- `qsrEventTimeStamp`
- `qsrPresTgtMapped`
- `qsrPresTgtUnmapped`
- `qsrEventSeverity`

Target presentation notifications are sent for the following event:

- Target Presentation
  - State: Presented (mapped) or unpresented (unmapped)
  - Target name
  - Blade number (1 or 2)

VP Group Notification

The VP group notification indicates that the specified VP group is enabled or disabled, or that its name has been changed.

`qsrVPGroupStatusChanged` uses the following objects:

- `qsrBladeSlot`
- `qsrVPGroupIndex`
- `qsrVPGroupStatus`
- `qsrEventTimeStamp`
- `qsrEventSeverity`

VP group notifications are sent for the following events:

- Change in name of a VP group
- Enabling and disabling a VP group

Sensor Notification

The sensor notification indicates that the state for the specified sensor is not `normal`. When the sensor returns to the normal state, this event is sent with the `qsrEventSeverity` object set to `clear`.

`qsrSensorNotification` uses the following objects:

- `qsrSensorValue`
- `qsrSensorState`

- `qsrEventTimeStamp`
- `qsrEventSeverity`

Sensor notifications are sent for the following events:

- Over-temperature:
  - Blade number (1 or 2)
  - Sensor number (1 of 3)
- Temperature returned to normal
  - Blade number (1 or 2)
  - Sensor number (1 of 3)
- Fans at high speed:
  - PCM number (1 or 2)
- Fans returned to normal speed:
  - PCM number (1 or 2)
- PCM installed:
  - PCM number (1 or 2)
- PCM removed:
  - PCM number (1 or 2)
- PCM powered (AC power connected):
  - PCM number (1 or 2)
- PCM not powered (AC power removed):
  - PCM number (1 or 2)
- Fan failed:
  - PCM number (1 or 2)
  - Fan number (1 of 3)
- Fan returned to operational state:
  - PCM number (1 or 2)
  - Fan number (1 of 3)

Generic Notification

The generic notification reports events other than the defined event types. It provides a description object that identifies the event in clear text.

`qsrGenericEvent` uses the following objects:

- `qsrEventTimeStamp`
- `qsrEventSeverity`
- `qsrEventDescription`

Generic notifications are sent for the following events:

- Fibre Channel port configuration change:
  - Blade number (1 or 2)
  - Port number (1 of 4)
- iSCSI port configuration change:
  - Blade number (1 or 2)
  - Port number (1 of 4)
- iSNS configuration change:
  - Blade number (1 or 2)
- NTP configuration change:
  - Blade number (1 or 2)
- Router configuration change:
  - Blade number (1 or 2)
- Management port configuration change:
  - Blade number (1 or 2)
- Firmware upgrade complete:
  - Blade number (1 or 2)
- Reboot blade:
  - Blade number (1 or 2)

C Log Messages

This appendix provides details about messages logged to a file. (For details about viewing the router logs, see the *iSR6200 Command Line Interface (CLI) User's Guide* or the *iSR6200 Router Manager User's Guide*.) The message log is persistent because it is maintained across router power cycles and reboots.

Information in Table C-1 is organized as follows:

- The **ID** column specifies the message identification numbers in ascending order.
- The **Log Message** column indicates the message text shown in the CLI or SANsurfer Router Manager router log. Note that:
  - Log messages for the iSCSI driver module are common to both iSCSI ports. Log messages beginning with `#0` denote iSCSI port 1 (GE1) and log messages beginning with `#1` denote iSCSI port 2 (GE2).
  - Log messages for the Fibre Channel driver module are common to both Fibre Channel ports. Log messages beginning with `#0` denote Fibre Channel port 1 (FC1) and log messages beginning with `#1` denote Fibre Channel port 2 (FC2).
- The **Module Type** column specifies the message reporting module, where:
  - **App** = Application module
  - **FC** = Fibre Channel driver
  - **FCIP** = Fibre Channel IP driver
  - **iSCSI** = iSCSI driver
  - **System** = System module

- **TOE** = TCP/IP offload engine module
- **User** = User module

- The **Msg. Type** column specifies the log message type, where:
  - **Error** = Error log message
  - **Fatal** = Fatal log message
  - **Info** = Informational log message

- The **Description** column provides additional information about the log message.

Table C-1. iSR6200 Router Log Messages

ID	Log Message	Module Type	Msg. Type	Description
40967	`QLBA_NullDoorbell: driver unloaded, port disabled`	App	Error	NULL doorbell routine for unloaded drivers. When a driver is unloaded, the doorbell routine is redirected to this NULL routine.
40996	`QLBA_ProcessTrb: Processing unsupported ordered tag command`	App	Error	Processing unsupported ordered tag task management command.
41004	`QLBA_ProcessTrb: Processing unsupported head of queue tag command`	App	Error	Processing unsupported head-of-queue task management command.
41058	`QLBA_CreateTargetDeviceObject: Too many devices`	App	Error	Unable to create an object for the target device; exceeded the maximum number of target devices.
41060	`QLBA_CreateTargetNodeObject: Too many devices`	App	Error	Unable to create an object for the target node; exceeded the maximum number of target devices.
41067	`QLBA_CreateLunObject: LunObject memory unavailable`	App	Error	Memory unavailable for LUN object.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
41077	`QLBA_CreateInitiatorObject: Too many initiators`	App	Error	Unable to create an object for initiator object; exceeded the maximum number of initiators.
41096	`QLBA_DisplayTargetOperationStatus: PCI Error, Status 0x%.2x`	App	Error	Process control block status indicates that a peripheral component interconnect (PCI) error occurred during a target operation.
41106	`QLBA_DisplayInitiatorOperationStatus: DMA Error, Status 0x%.2x`	App	Error	Process control block status indicates that a direct memory access (DMA) error occurred during an initiator operation.
41107	`QLBA_DisplayInitiatorOperationStatus: Transport Error, Status 0x%.2x`	App	Error	Process control block status indicates that a transport error (protocol) occurred during an initiator operation.
41111	`QLBA_DisplayInitiatorOperationStatus: Data Overrun, Status 0x%.2x`	App	Error	Process control block status indicates that a data overrun error occurred during an initiator operation.
41234	`QLIS_LoginPduContinue: Operation failed. Initiator 0x%x, TPB status 0x%x`	App	Error	iSCSI login failed between receipt of protocol data unit (PDU) and request for the data segment.
41238	`QLKV_ValidateLoginTransitCsgNsgVersion failed (status 0x%x)`	App	Error	iSCSI login failed due to unsupported version number in received login PDU.
41257	`QLIS_LoginPduContinue: Invalid initiator name. Initiator:`	App	Error	iSCSI Login PDU contains invalid initiator name. The format and character set used to form the initiator name is invalid.
41265	`QLIS_LoginPduContinue: Target not configured for Portal`	App	Error	iSCSI target login was attempted to a portal (iSCSI1 or iSCSI2) on which the target is not presented.
41267	`QLIS_LoginPduContinue: Target not found. Target name:`	App	Error	iSCSI Login PDU received for a target with a target name unknown to the router.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
41268	`QLIS_LoginPduContinue: Missing target name`	App	Error	iSCSI Login PDU received without a target name for a normal session.
41270	`QLIS_LoginPduContinue: TSIH is 0 but InitiatorName key/value not provided`	App	Error	iSCSI Login PDU received without an initiator name key or value.
41272	`QLIS_LoginPduContinue: CONN_STATE_IN_LOGIN, Unknown InitTaskTag`	App	Error	iSCSI Login PDU received with an incorrect initiator task tag for a session that is partially logged in. This would occur if a login PDU other than the initial login PDU used an initiator task tag that was different from the initiator task tag provided in the initial login PDU.
41283	`QLIS_LoginPduContinue: TSIH 0x%x out of range`	App	Error	iSCSI login PDU was received with a target session identifying handle (TSIH) out of range. This would occur if the iSCSI initiator attempting the login failed to used the TSIH value provided in the Target Login Response PDU (router is target) in subsequent login PDUs.
41284	`QLIS_LoginPduContinue: Session does not exist, invalid TSIH 0x%x`	App	Error	iSCSI Login PDU was received with an invalid TSIH value. The TSIH is invalid because there is no session with that TSIH value. This would occur if the iSCSI initiator attempting the login failed to used the TSIH value provided in the target login response PDU (router is target) in subsequent login PDUs.
41353	`QLIS_LoginPduContinue: Session does not exist, invalid TSIH 0x%x`	App	Error	iSCSI Login rejected due to a CHAP authentication error.
41354	`QLIS_LoginPduContinue: Unexpected CHAP key detected`	App	Error	iSCSI Login rejected due to a CHAP key error.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
41508	`QLBI_SetPortInfo: QLUT_AllocatePortalObject failed (PortType 0x%x, PortId 0x%x)`	App	Error	Failed to allocate an object for *Set Port Info* IOCTL processing: PortType: 0 = Fibre Channel, 1 = iSCSI PortId: 0 = FC1 or iSCSI1(GE1), 1 = FC2 or iSCSI2 (GE2)
41626	`QLBI_GetLunInfo: INQUIRY failed, TPB status 0x%x`	App	Error	Inquiry command failed. The Inquiry command was issued by the router as part of its discovery process.
41629	`QLBI_GetLunInfo: INQUIRY failed, TPB status 0x%x`	App	Error	Pass-Through command for Inquiry command for page 83 failed. The Inquiry command was issued by the router as part of its discovery process.
41635	`QLBI_Passthru: Invalid data length %d bytes`	App	Error	Pass-Through command for Read Capacity command failed. The Read Capacity command was issued by the router as part of its discovery process.
41636	`QLBI_GetLunInfo: INQUIRY failed, TPB status 0x%x`	App	Error	Read Capacity command failed. The Read Capacity command was issued by the router as part of its discovery process.
41696	`QLBI_GetLunInfo: INQUIRY failed, TPB status 0x%x`	App	Error	Pass-Through command issued by management application (such as GUI) was aborted.
41700	`QLBI_Passthru: Invalid CDB length %d bytes`	App	Error	Pass-Through command issued by management application (such as GUI) failed due to invalid command descriptor block (CDB) length.
41701	`QLBI_Passthru: Invalid data length %d bytes`	App	Error	Pass-Through command issued by management application (such as GUI) failed due to invalid data length.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
41717	`QLBI_Passthru: Invalid data length %d bytes`	App	Error	Pass-Through command issued by management application (such as GUI) was interrupted or timed out.
41750	`QLBI_Ioctl: ERROR: Operation (0x%x) not supported in this mode`	App	Error	IOCTL operation unsupported. Operation code provided in log message.
41768	`QLBI_GetLunList: REPORT LUNS command failed`	App	Error	Report LUNs command failed. The Report LUNs command was issued by the router as part of its discovery process.
41769	`QLBI_GetLunList: REPORT LUNS command failed with CHECK CONDITION, SCSI STATUS 0x%02X`	App	Error	Report LUNs command failed with check condition status. The Report LUNs command was issued by the router as part of its discovery process.
41771	`QLBI_GetLunList: Lun allocation failed for LunId %d`	App	Error	Failed to allocate LUN object; out of resources.
41994	`QLFC_Login: VpIndex (%d) out of range`	App	Error	Login attempted using Fibre Channel virtual port (VP) index that is out-of-range (range = 0–31). Index reported in log message.
41995	`QLFC_Login: VP Index 0x%x not configured`	App	Error	Login attempted using Fibre Channel VP index that has not been configured. Operation attempted on an unconfigured VP.
42002	`QLFC_Login: Can't open connection`	App	Error	Attempting login but Fibre Channel connection cannot be opened.
42024	`QLFC_Logout: No active path to device. WWPN: %.2X%.2X%.2X%.2X%.2X%.2X%.2X%.2X`	App	Error	Attempting logout of device for which there is no active path (WWPN not found).

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
42027	`QLFC_Logout: VP Index 0x%x not configured`	App	Error	Logout attempted using Fibre Channel VP index that has not been configured. Operation attempted on an unconfigured VP.
42068	`QLFC_HandleTeb: System Error`	App	Error	Event notification; Fibre Channel processor encountered a system error (unrecoverable firmware error).
42069	`QLFC_HandleTeb: Driver Fatal Error`	App	Error	Event notification; Fibre Channel driver encountered a fatal error.
42072	`QLFC_HandleTeb: Driver Fatal Error`	App	Error	Event notification; Fibre Channel port logged out.
42242	`QLIS_AllocateSessionObject: Out of session resources`	App	Error	Failed to allocate object for iSCSI session; out of session resources.
42252	`QLIS_EnqueueiScsiPdu: Duplicate PDU, CmdSN %d (0x%x), dropping it`	App	Error	Received iSCSI PDU with duplicate command sequence number (CmdSN). Command PDU will be dropped.
42258	`QLIS_InstantiateSession: Can't add Initiator to the database`	App	Error	Unable to allocate iSCSI initiator object while instantiating session.
42259	`QLIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in`	App	Error	iSCSI session login rejected because the maximum number of allowed hosts are already logged in.
42404	`QLIS_InstantiateSession: Maximum number (%d) of allowed hosts already logged in`	App	Error	Failed to execute iSCSI Command PDU because its CmdSN is out-of-range. Log message contains the incorrect CmdSN, the valid CmdSN range, the first byte of the CDB, and the data length.
42648	`QLIS_HandleTeb: Driver Fatal Error`	App	Error	Event notification; iSCSI driver encountered a fatal error.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
42649	`QLIS_HandleTeb: Unload Driver`	App	Error	Event notification; an IOCTL request was received to unload the iSCSI driver.
42654	`QLIS_HandleTeb: iSNS Connection Failed`	App	Error	Event notification; attempt to connect to the iSNS server failed.
43265	`QLUT_AllocateTpbExtension: TPB allocation failed`	App	Error	Failed to allocate memory for TPB extension.
43267	`QLUT_AllocateTpbExtension: Alloc of DSD failed for buffer len %d`	App	Error	Failed to allocate data segment descriptor (DSD) (buffer length %d).
43268	`QLUT_AllocateTpbExtension: Data buffer allocation failed (length %d)`	App	Error	Failed to allocate data buffer (length %d).
44549	`QLDM_HandleMigError: Migration Job %d stopped for Src Lun %hd Dest Lun %hd Error %x AdditionalErrorStatus %x at line %d`	App	Error	An error occurred on an I/O that was issued for a migration job. The message provides the job ID, source, and destination LUN IDs, as well as the error.
53254	`System Booting Up.`	App	Info	Router is booting up.
53357	`QLBA_ProcessTpb: De-compression failed. Disabling compression temporarily`	App	Info	Decompression failed. Disabling compression temporarily.
53584	`QLIS_LoginPduContinue: [0x%x] SES_STATE_LOGGED_IN NORMAL`	App	Info	iSCSI session full feature login.
53585	`QLIS_LoginPduContinue: [0x%x] SES_STATE_LOGGED_IN DISCOVERY`	App	Info	iSCSI session discovery login.
53586	`QLIS_LoginPduContinue: Initiator: %s`	App	Info	iSCSI login of Initiator: %s.
53587	`QLIS_LoginPduContinue: Target: %s`	App	Info	iSCSI login of Target: %s.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
54274	`QLFC_Login: Origin 0x%x, VP Index 0x%x, Id 0x%x`	App	Info	Fibre Channel login occurred, origin *xx* (1 = adapter, 2 = target, 3 = initiator), VP (virtual port) *xx*, ID (loop ID) *xx*.
54275	`QLFC_Login: Port ID  %.2x%.2x%.2x`	App	Info	Fibre Channel login occurred with port ID *xx.xx.xx*.
54276	`QLFC_Login: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x`	App	Info	Fibre Channel login occurred with WWNN *xx.xx.xx.xx.xx.xx.xx.xx*.
54277	`QLFC_Login: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x`	App	Info	Fibre Channel login occurred with WWPN *xx.xx.xx.xx.xx.xx.xx.xx*.
54306	`QLFC_Logout: Origin 0x%x, VP Index 0x%x, Id 0x%x`	App	Info	Fibre Channel Logout: Origin 0x%x, VP Index 0x%x, Id 0x%x.
54307	`QLFC_Logout: Port ID   %.2x%.2x%.2x`	App	Info	Fibre Channel Logout: Port ID %.2x%.2x%.2x
54308	`QLFC_Logout: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x`	App	Info	Fibre Channel Logout: Node Name *xx xx xx xx xx xx xx xx*.
54309	`QLFC_Logout: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x`	App	Info	Fibre Channel Logout: Port Name *xx xx xx xx xx xx xx xx.*
54359	`QLFC_Logout: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x`	App	Info	Fibre Channel login event notification, VP (virtual port) *xx*.
54683	`QLIS_OpenConnectionNotification: Target connection opened (Port %d, DDB %d)`	App	Info	iSCSI target connection opened for port %d, data description block (DDB) %d.
54938	`QLIS_OpenConnectionNotification: Target connection opened (Port %d, DDB %d)`	App	Info	Event notification; iSCSI open connection request.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
54939	QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED	App	Info	Event notification; iSCSI close connection request or connection closed.
54940	QLIS_HandleTeb: UTM_EC_CLOSE_CONNECTION or UTM_EC_CONNECTION_CLOSED	App	Info	Event notification; iSCSI connection closed.
54941	QLIS_HandleTeb:iSNS Server Open Connection succeeded	App	Info	Event notification; connection opened with iSNS server.
54943	QLIS_HandleTeb: UTM_EC_ISNS_SCN	App	Info	Event notification; iSNS registered state change notification (RSCN) received.
54945	QLIS_HandleTeb: UTM_EC_ISNS_CLIENT_DISCOVERED	App	Info	Event notification; iSNS client discovered.
56321	QLMP_Logout: Virtual Target Logged out	App	Info	An array went offline because all the target ports of the array went offline.
56322	QLMP_Logout: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	App	Info	WWNN of the array that went offline. This is tied with ID 56321.
56323	QLMP_Logout: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	App	Info	WWPN of the array that went offline. This is tied with ID 56321.
56346	QLMP_CombineMPDevice: Virtual Target Online	App	Info	An array came online.
56347	QLMP_CombineMPDevice: Node Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	App	Info	WWNN of the array that came online. This is tied with ID 56346.
56348	QLMP_CombineMPDevice: Port Name %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x	App	Info	WWPN of the array that came online. This is tied with ID 56346.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
56842	`QLDM_ResumeMigration: Failed to resume job: %d, job's current state: 0x%x, error: %d`	App	Info	Failed to resume a paused job.
56865	`QLDM_DelayedStart:%d Failed to start job : Job ID: %d`	App	Info	Failed to start a delayed schedule job.
56866	`Lun is already used for of some other migration job`	App	Info	Migration add failed because LUN is part of another migration job.
56867	`Selected Lun is a Controller Lun`	App	Info	Migration being added with a LUN that is a controller LUN. Data LUNs are required for configuring migration jobs.
56868	`Selected Lun is Masked, It cant be used for Offline Migration`	App	Info	Migration job being added for a LUN that is masked to an initiator on the router. Mapped LUNs cannot be used for offline migration jobs.
56869	`Read Capacity is not available for the Lun`	App	Info	Migration job being added for a LUN for which no read capacity Information is available. Migration add will fail.
56870	`QLDM_CreateMigrationObject: Failed to create Source Lun Object`	App	Info	Failed to allocate memory for the source LUN of a migration job.
56871	`QLDM_CreateMigrationObject: Failed to create Destination Lun Object`	App	Info	Failed to allocate memory for the destination LUN of a migration job.
56872	`QLDM_CreateMigrationObject: MigrationObject memory unavailable`	App	Info	Failed to allocate memory for the migration job.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
56880	`Start time got from user %lu Cur Time: %lu Diff: %d`	App	Info	The log shows the configured start time and current time for a delayed migration job.
56881	`Failed to stop migration job id %u`	App	Info	Failed to stop a migration job; the error message includes the job ID.
56884	`QLDM_DeleteMigrationJobByLun: Could not find migration object`	App	Info	Did not find a migration job for the associated LUN object.
69652	`#%d: qlutm_init: Diagnostic failed, invalid SRAM`	iSCSI	Fatal	iSCSI processor SRAM test failed.
69653	`#%d: qlutm_init: Diagnostic failed, fail reboot`	iSCSI	Fatal	iSCSI processor failed diagnostic reboot.
69654	`#%d: qlutm_init: Diagnostic failed, invalid NVRAM`	iSCSI	Fatal	iSCSI processor failed NVRAM diagnostic.
69655	`#%d: qlutm_init: Diagnostic failed, invalid DRAM`	iSCSI	Fatal	iSCSI processor failed DRAM diagnostic.
69656	`#%d: qlutm_init: Failed to return diagnostic result to Bridge`	iSCSI	Fatal	iSCSI processor failed to return diagnostic results.
69941	`#%d: QLUtmProcessResponseQueue: Invalid handle %x EntryType %x`	iSCSI	Fatal	Response queue entry contains an invalid handle.
69951	`#%d: QLSetNvram: QLRebootTimer failed AF %x RS %x Time %d`	iSCSI	Fatal	Set NVRAM reboot timer failed.
69964	`#%d: QLDisable: QLRebootTimer failed AF %x RS %x Time %d`	iSCSI	Fatal	Port disable reboot timer failed.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
69966	`#%d: QLEnable: QLRebootTimer failed AF %x RS %x Time %d`	iSCSI	Fatal	Port enable reboot timer failed.
70224	`#%d: QLProcSrblessiSNSResponse: Invalid handle %x`	iSCSI	Fatal	iSNS response contains an invalid handle.
70400	`#%d: QLInitializeDevice: QLStartAdapter failed`	iSCSI	Fatal	Start iSCSI processor failed.
70417	`#%d: QLInitializeAdapter: QLInitializeFW failed`	iSCSI	Fatal	iSCSI processor firmware initialization failed.
70432	`#%d: QLDoInterruptServiceRoutine: PortFatal interrupt. PortFatalErrorStatus %08x CSR %08x AS %x AF %x`	iSCSI	Fatal	iSCSI processor port fatal error.
70448	`#%d: QLStartAdapter: QLRebootTimer failed AF %x RS %x Time %d`	iSCSI	Fatal	Start iSCSI processor reboot timer failed.
70489	`#%d: QLIsrDecodeMailbox: System Error 8002 MB[1-7] %04x %04x %04x %04x %04x %04x %04x`	iSCSI	Fatal	iSCSI processor fatal system error.
70499	`#%d: QLProcessResponseQueue: Invalid handle for ET_PASSTHROUGH_STATUS`	iSCSI	Fatal	Response queue invalid handle for ET pass-through.
70501	`#%d: QLProcessResponseQueue: Invalid entry type in response queue %x`	iSCSI	Fatal	Response queue invalid entry type.
70502	`#%d: QLProcessResponseQueue: Invalid handle %x EntryType %x`	iSCSI	Fatal	Response queue invalid handle for specified entry type.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
70524	`#%d: QLProcessAen: Invalid event %x`	iSCSI	Fatal	Asynchronous event for unknown event type.
70544	`#%d: QLRebootTimer: Reboot failed!`	iSCSI	Fatal	Reboot timer failed.
70563	`#%d: QLRebootTimer: Reboot failed!`	iSCSI	Fatal	iSCSI driver missed iSCSI processor heartbeat. iSCSI processor rebooted.
70564	`#%d: QLRebootTimer: Reboot failed!`	iSCSI	Fatal	iSCSI processor failed to complete operation before timeout.
70609	`#%d: QLRebootTimer: Reboot failed!`	iSCSI	Fatal	iSCSI processor system error restart.
70610	`#%d: QLProcessSystemError: RebootHba failed`	iSCSI	Fatal	iSCSI processor reboot failed.
70784	`#%d: QLConfigChip: invalid NVRAM`	iSCSI	Fatal	iSCSI processor NVRAM invalid (checksum error).
70835	`#%d: QLStartFw: MBOX_CMD_SET_FLASH failed %x`	iSCSI	Fatal	The iSCSI controller Set Flash command failed.
70836	`#%d: QLStartFw: Invalid Fw loader state 0x%x`	iSCSI	Fatal	The iSCSI controller failed to load firmware.
70837	`#%d: QLStartFw: Load Fw loader timeout`	iSCSI	Fatal	The iSCSI controller firmware load operation timed out.
70938	`#%d: ql_adapter_up: Failed to initialize adapter`	iSCSI	Fatal	The iSCSI controller failed to initialize.
72351	`#%d: QLProcSrblessiSNSResponse: Invalid handle %x`	iSCSI	Fatal	The iSCSI controller reported that an iSNS response had an invalid handle.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
73990	`#%d: QLUtmIoctlEnable: Initialize FW failed`	iSCSI	Error	The iSCSI processor failed firmware initialization.
74056	`#%d: QLRunDiag: MBOX Diag test internal loopback failed %x %x`	iSCSI	Error	The iSCSI processor failed the internal loopback test.
74057	`#%d: QLRunDiag: MBOX Diag test external loopback failed %x %x`	iSCSI	Error	The iSCSI processor failed the external loopback test.
74068	`#%d: QLUtmReceiveScsiCmd: Invalid ATIO Continuation type %x`	iSCSI	Error	The iSCSI processor reported an invalid Accept Target I/O (ATIO) Continuation type *x*.
74069	`#%d: QLUtmProcessResponseQueue: Immediate data addr %08x:%08x in unsupported PduType`	iSCSI	Error	The iSCSI processor reported an Immediate data address (*xxxxxxxx:xxxxxxxx*) in an unsupported PDU Type.
74241	`#%d: QLiSNSEnableCallback: iSNS Server TCP Connect failed`	iSCSI	Error	The iSCSI processor could not connect with the iSCSI name server (iSNS).
74577	`#%d: QLIsrDecodeMailbox: NVRAM invalid`	iSCSI	Error	The iSCSI processor reported that the iSCSI port NVRAM contains invalid data (checksum error).
74580	`#%d: QLIsrDecodeMailbox: AEN %04x, Duplicate IP address detected, MB[1-5] %04x %04x %04x %04x %04x`	iSCSI	Error	The iSCSI processor reported a duplicate IP address was detected (address *xxxx xxxx xxxx xxxx xxxx*).
74587	`#%d: QLIsrDecodeMailbox: Link down`	iSCSI	Error	The iSCSI processor reported a link down condition.
74656	`#%d: QLReadyTimer: Adapter missed heartbeat for %d seconds. Time left %d`	iSCSI	Error	The driver failed to receive a heartbeat from the iSCSI processor for the specified number of seconds.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
74659	`#%d: QLReadyTimer: Adapter missed heartbeat for 0x%x seconds`	iSCSI	Error	The iSCSI processor (adapter) failed to provide a heartbeat for *x* seconds.
74660	`#%d: QLReadyTimer: Abort pTpb=%p failed, DrvCount 0x%x`	iSCSI	Error	The iSCSI processor failed to complete an abort request.
74661	`#%d: QLTimer: Abort pTpb=%p, Type %x, Timeout 0x%x DrvCount 0x%x, DdbIndex 0x%x`	iSCSI	Error	The driver timed out an iSCSI processor operation and is aborting the operation.
74663	`#%d: QLReadyTimer: MBOX_CMD %04x %04x %04x %04x %04x %04x %04x %04x timed out`	iSCSI	Error	The driver timed out an iSCSI processor mailbox command.
74665	`#%d: QLReadyTimer: QLiSNSReenable failed.`	iSCSI	Error	The driver timed out while attempting to reconnect with the iSNS.
74705	`#%d: QLProcessSystemError: Restart RISC`	iSCSI	Error	The iSCSI processor was restarted.
74746	`#%d: QLInitializeFW: MBOX_CMD_INITIALIZE_FIRMWARE failed %04x %04x %04x %04x %04x %04x`	iSCSI	Error	The iSCSI processor rejected the firmware initialize command.
74784	`#%d: QLUpdateInitiatorData: No more room in Initiator Database.`	iSCSI	Error	The driver's initiator database is full. The driver is capable of storing 1024 iSCSI initiators in its database. Use the CLI or GUI to remove unwanted or unused iSCSI initiators.
74800	`#%d: QLSetTargetData: No more room in Target Database.`	iSCSI	Error	The driver's target database is full. Use the CLI or GUI to remove unwanted or unused iSCSI targets.
75008	`#%d: ql_process_error: OB_TCP_IOCB_RSP_W returned DdbInx 0x%x pTpb %p`	iSCSI	Error	A TCP retry for a frame failed on the connection ddbIndex. Tpb contains the frame memory address.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
86347	`#%d: QLDisable: Restart RISC`	iSCSI	Info	Restart iSCSI processor (RISC).
86349	`#%d: QLEnable: Restart RISC to update EEPROM`	iSCSI	Info	EEPROM updated, restart iSCSI processor (RISC).
86874	`#%d: QLIsrDecodeMailbox: Link up`	iSCSI	Info	Link up reported by iSCSI processor for GE1 or GE2.
87346	`#%d: QLGetFwStateCallback: link 100Mb FDX`	iSCSI	Info	The iSCSI controller reported a link speed or configuration of 100Mb full-duplex (FDX).
87348	`#%d: QLGetFwStateCallback: link 1000Mb FDX`	iSCSI	Info	The iSCSI controller reported a link speed/configuration of 1000Mb FDX.
87350	`#%d: QLGetFwStateCallback: Invalid link speed 0x%x`	iSCSI	Info	The iSCSI controller reported an invalid link speed.
102419	`#%d: qlutm_init: Diagnostic failed, port 1 invalid SRAM`	FC	Fatal	FC1 processor SRAM test failed.
102420	`#%d: qlutm_init: Diagnostic failed, port 1 POST failed`	FC	Fatal	FC1 processor power-on self-test (POST) failed.
102421	`#%d: qlutm_init: Diagnostic failed, port 2 invalid SRAM`	FC	Fatal	FC2 processor SRAM test failed.
102422	`#%d: qlutm_init: Diagnostic failed, port 2 POST failed`	FC	Fatal	FC2 processor POST failed.
102423	`#%d: qlutm_init: Failed to return diagnostic result to Bridge`	FC	Fatal	Fibre Channel processor failed to return diagnostic results.
102656	`#%d: QLInitializeAdapter: Reset ISP failed`	FC	Fatal	Fibre Channel processor failed reset.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
102657	`#%d: QLInitializeAdapter: Load RISC code failed`	FC	Fatal	Fibre Channel processor firmware load failed.
102658	`#%d: QLInitializeAdapter: Load ISP2322 receive sequencer code failed`	FC	Fatal	Fibre Channel processor receive sequencer code load failed.
102659	`#%d: QLInitializeAdapter: Load ISP2322 transmit sequencer code failed`	FC	Fatal	Fibre Channel processor transmit sequencer code load failed.
102662	`#%d: QLInitializeAdapter: Verify Checksum command failed (%x)`	FC	Fatal	Fibre Channel processor firmware checksum failed.
102680	`#%d: QLInitializeFW: FAILED`	FC	Fatal	Fibre Channel processor firmware initialization failed.
102688	`#%d: QLInterruptServiceRoutine: Risc pause %x with parity error hccr %x, Disable adapter`	FC	Fatal	Fibre Channel processor paused due to internal parity error.
102689	`#%d: QLInterruptServiceRoutine: Invalid interrupt status: %x`	FC	Fatal	Fibre Channel processor returned an invalid interrupt status.
102716	`#%d: QLIsrEventHandler: System error event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x`	FC	Fatal	Fibre Channel processor system error.
102746	`#%d: QLProcessResponseQueue: Invalid handle %x, type %x`	FC	Fatal	Response queue entry contains an invalid handle.
102752	`#%d: QLTimer: Ext Ram parity error exceed limit cnt 0x%x, limit 0x%x, Disabled adapter`	FC	Fatal	Fibre Channel processor external SRAM parity error count exceeded limit; Fibre Channel port disabled.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
102755	`#%d: QLTimer: Heartbeat failed`	FC	Fatal	Fibre Channel processor heartbeat failed.
102800	`#%d: QLRestartRisc: restart RISC`	FC	Fatal	Fibre Channel processor being restarted.
106583	`#%d: QLUtmReceiveIo: Path invalid/FW No resource count %x`	FC	Error	The Fibre Channel processor received a SCSI command for an unknown target path or has run out of resources to execute additional commands.
106589	`#%d: QLIoctlEnable: Adapter disabled`	FC	Error	The Fibre Channel processor was disabled by an IOCTL request to the driver.
106590	`#%d: QLIoctlEnable: Initialize FW error`	FC	Error	The Fibre Channel processor firmware failed initialization. The request to initialize was received by the driver in an IOCTL request.
106592	`#%d: QLIoctlRunDiag: Diagnostic loopback command failed %x % %x %x`	FC	Error	The Fibre Channel processor failed the external loopback test.
106593	`#%d: QLIoctlDisable: Re-initialize adapter failed`	FC	Error	The Fibre Channel processor failed to re-initialize in response to an IOCTL disable request.
106803	`#%d: QLIsrEventHandler: Link down (%x)`	FC	Error	The Fibre Channel processor reported a link down condition.
106813	`#%d: QLIsrEventHandler: Unexpected async event (%x), MB1=%x, MB2=%x, MB3=%x, MB4=%x, MB5=%x, MB6=%x, MB7=%x`	FC	Error	The Fibre Channel processor reported an unexpected asynchronous event. The mailbox registers provide status, event code, and data related to the event.
106847	`#%d: QLProcessResponseQueue: Invalid EntryStatus %x, type %x`	FC	Error	The Fibre Channel controller reported an invalid Entry Status %x, type %x.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
106851	`#%d: QLTimer: Heartbeat failed`	FC	Error	The Fibre Channel controller failed to provide a heartbeat.
106853	`#%d: QLTimer: Link error count (0x%x) exceeded, link down`	FC	Error	The driver has determined that the Fibre Channel link is unreliable and unusable due to the number of errors encountered. The link has been taken down.
106912	`#%d: QLReserveLoopId: out of loop Ids`	FC	Error	The Fibre Channel processor was unable to obtain the number of loop IDs required. This failure occurs only when the Fibre Channel processor is running multi-ID firmware.
106928	`#%d: QLMarkDeviceOffline: Device Id: %x marked offline, cLinkDownTimeout = %x, cPortDownRetryCount=%x`	FC	Error	The driver was unable to re-establish connection to the target within the timeout and retry counts, and is therefore marking it *offline*.
106948	`#%d: QLSnsGetAllNext: Name server login FAILED %x`	FC	Error	The Fibre Channel processor is unable to log into the Fibre Channel fabric name server.
107029	`#%d: QLUpdateDeviceData: out of slots in host database`	FC	Error	The driver's host (initiator) database is full.
107030	`#%d: QLUpdateDeviceData: out of slots in target database`	FC	Error	The driver's target database is full.
107041	`#%d: QLUpdateDeviceDatabase 0x%x: GET_ID failed %x`	FC	Error	The driver's host (initiator) database is full. Maximum host database is 64.
107056	`#%d: QLUpdateDeviceDatabase 0x%x: out of slots in host database`	FC	Error	The drivers host (initiator) database is full.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
107078	`#%d: QLUpdatePort 0x%x: out of slots in host database`	FC	Error	The driver was unable to re-establish connection to the target within the timeout and retry counts, and is therefore marking it *offline*.
107984	`#%d: QLWriteFlashDword: Write fails at addr 0x%x data 0x%x`	FC	Error	The Fibre Channel controller failed a Flash write (address *x* data *x*).
108032	`#%d: QLGetVpDatabase: MBOX_CMD_GET_VP_DATABASE for VP %d fatal error`	FC	Error	The Fibre Channel controller failed the Get VP Database command (for virtual port %d).
108033	`#%d: QLGetVpDatabase: MBOX_CMD_GET_VP_DATABASE for VP %d failed %x`	FC	Error	The Fibre Channel controller failed the Get VP Database command (for virtual port %d) with status *x*.
108049	`#%d: QLVerifyMenloFw: EXECUTE_COMMAND_IOCB failed MB0 %x MB1 %x`	FC	Error	The Fibre Channel controller reported failure status for an Execute IOCB (input/output control block) command.
108050	`#%d: QLVerifyMenloFw: EXECUTE_COMMAND_IOCB fatal error`	FC	Error	The Fibre Channel controller reported a fatal error while processing an Execute IOCB command.
108064	`#%d: QLGetFwState: Get Firmware State failed 0-3 %x %x %x %x`	FC	Error	The Fibre Channel controller reported failure status for a Get Firmware State command.
118882	`#%d: QLIoctlDisable: Reset adapter`	FC	Info	Request to reset the Fibre Channel processor (adapter) received from IOCTL interface.
119088	`#%d: QLIsrEventHandler: LIP occurred (%x): mailbox1 = %x`	FC	Info	Fibre Channel loop initialization process (LIP) occurred. The LIP type is reported, as is the contents of the Fibre Channel processor's mailbox 1 register.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
119089	`#%d: QLIsrEventHandler: LIP reset occurred (%x): mailbox1 = %x`	FC	Info	Fibre Channel LIP reset occurred. The LIP reset type is reported, as is the contents of the Fibre Channel processor's mailbox 1 register.
119090	`#%d: QLIsrEventHandler: Link up (%x) mailbox1 = %x`	FC	Info	Fibre Channel link up occurred. Event status is reported, as is the contents of the Fibre Channel processor's mailbox 1 register.
119092	`#%d: QLIsrEventHandler: Link mode up (%x): RunTimeMode=%x`	FC	Info	Fibre Channel link up occurred. Event status is reported, as is the RunTimeMode (0 = loop, 1 = point-to-point).
119093	`#%d: QLIsrEventHandler: RSCN update (%x) rscnInfo: %x`	FC	Info	An RSCN was received. Event status is reported, as is the RSCN information.
119097	`#%d: QLIsrEventHandler: Port update (%x) mb1-3 %x %x %x`	FC	Info	Fibre Channel port update. Event status is reported, as is the contents of the Fibre Channel processor's mailbox 1, 2, and 3 registers.
119144	`#%d: QLTimer: VP %d discover a reject device PID %02x%02x%02x`	FC	Info	A virtual port logged into a device, but the device rejects the login.
120278	`#%d: QLFlashGetNvram: Invalid Serial Link Control 0x%x for port %d`	FC	Info	Update NVRAM for the invalid Serial Link Control for mezzanine platform.
120373	`#%d: QLIsrEventHandler: DCBX Completed (%x)`	FC	Info	For FCoE protocol, the data center bridging exchange (DCBX) protocol completes.
120374	`#%d: QLIsrEventHandler: IDC Completion (%x) %x, %x, %x, %x, %x, %x, %x`	FC	Info	For FCoE protocol, the inter-driver communications (IDC) completes.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
120375	`#%d: QLIsrEventHandler: IDC Notification (%x), %x, %x, %x, %x, %x, %x, %x`	FC	Info	For FCoE protocol, the IDC notification comes from another driver.
120376	`#%d: QLIsrEventHandler: IDC Time Extended (%x), %x, %x, %x, %x, %x, %x, %x`	FC	Info	For FCoE protocol, the IDC time extended notification receives.
120377	`#%d: QLIsrEventHandler: DCBX Started (%x)`	FC	Info	For FCoE protocol, the DCBX protocol has started.
120378	`#%d: QLIsrEventHandler: FCF Config Error (%x), MB1=%x`	FC	Info	For FCoE protocol, the FCoE Forwarder (FCF) configuration error occurred.
120379	`#%d: QLIsrEventHandler: DCBX Parameter Changed (%x)`	FC	Info	For FCoE protocol, the DCBX parameters are changed.
139265	`QBRPC_Initialize: Entered`	User	Error	RPC (remote procedure call) server initialization entry point.
139266	`QBRPC_Initialize:GetBridge Mem Allocation error`	User	Error	Get System API memory allocation failed.
139267	`QBRPC_Initialize:GetBridgeAdv Mem Allocation error`	User	Error	Get System Advanced API memory allocation failed.
139268	`QBRPC_Initialize:GetMgmt Mem Allocation error`	User	Error	Get Management API memory allocation failed.
139269	`QBRPC_Initialize:GetIscsi Mem Allocation error`	User	Error	Get iSCSI API memory allocation failed.
139270	`QBRPC_Initialize:GetIscsiAdv Mem Allocation error`	User	Error	Get iSCSI advanced API memory allocation failed.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
139271	QBRPC_Initialize:GetIsns Mem Allocation error	User	Error	Get iSNS API memory allocation failed.
139272	QBRPC_Initialize:GetFcIntfc Mem Allocation error	User	Error	Get Fibre Channel Interface API memory allocation failed.
139273	QBRPC_Initialize:GetFcAdv Mem Allocation error	User	Error	Get Fibre Channel Advanced API memory allocation failed.
139280	QBRPC_Initialize:GetFcSfp Mem Allocation error	User	Error	Failed memory allocation for Get Fibre Channel SFP API.
139281	QBRPC_Initialize:GetLog Mem Allocation error	User	Error	Failed memory allocation for Get Log API.
139282	QBRPC_Initialize:GetStats Mem Allocation error	User	Error	Failed memory allocation for Get Statistics API.
139283	QBRPC_Initialize:InitListMem Allocation error	User	Error	Failed memory allocation for Get Initiator List API.
139284	QBRPC_Initialize:TargetList Mem Allocation error	User	Error	Failed memory allocation for Get Target List API.
139285	QBRPC_Initialize:LunList MemAllocation error	User	Error	Failed memory allocation for Get LUN List API.
139286	QBRPC_Initialize:PresTarget Mem Allocation error	User	Error	Failed memory allocation for Get Presented Targets List API.
139287	QBRPC_Initialize:LunMask Mem Allocation error	User	Error	Failed memory allocation for Get LUN Mask API.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
139288	QBRPC_Initialize:Init Mem Allocation error	User	Error	Failed memory allocation for Initiator API.
139289	QBRPC_Initialize:TgtDevice Mem Allocation error	User	Error	Failed memory allocation for Target Device API.
139296	QBRPC_Initialize:FcTgt Mem Allocation error	User	Error	Failed memory allocation for Fibre Channel Target API.
139297	QBRPC_Initialize:BridgeStatus Mem Allocation error	User	Error	Failed memory allocation for System Status API.
139298	QBRPC_Initialize:Diag Mem Allocation error	User	Error	Failed memory allocation for Diagnostic API.
139299	QBRPC_Initialize:DiagLog Mem Allocation error	User	Error	Failed memory allocation for Diagnostic Log API.
139300	QBRPC_Initialize:FruImage Mem Allocation error	User	Error	Failed memory allocation for FRU Image API.
139301	QBRPC_Initialize:OemMfg Mem Allocation error	User	Error	Failed memory allocation for OEM Manufacturing API.
139302	QBRPC_Initialize:Status Mem Allocation error	User	Error	Failed memory allocation for Status API.
139303	QBRPC_Initialize:TcpIpStats Mem Allocation error	User	Error	Failed memory allocation for TCP/IP Statistics API.
139304	QBRPC_Initialize:NtpStats Mem Allocation error	User	Error	Failed memory allocation for NTP Status API.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
139305	`QBRPC_Initialize:LunList MemAlloc error`	User	Error	Failed memory allocation for LUN List API.
139315	`QBRPC_FreeResources:Entered`	User	Error	RPC free resources entry point.
139553	`checkDuplicateIp: Detected Error %08x %08x%04x`	User	Error	Detected duplicate IP address for management port.
139930	`FcipRoute#%d Failed with Memory Allocation Error`	User	Error	Memory resources could not be allocated to an FCIP route. The route was not created. The router must be rebooted to clear this error.
139931	`FcipRoute#%d Failed with Invalid Arg Error`	User	Error	Invalid argument specified by user. The preceding message in the log indicates which parameter is in error.
139932	`FcipRoute#%d Failed with Unknown Device Error`	User	Error	Specified route or port (Fibre Channel or Ethernet) does not exist. Verify that the value entered is a valid value.
139933	`FcipRoute#%d Failed with Kernel Error`	User	Error	Invalid memory address was encountered while reading/writing or modifying FCIP route definition. Reboot the router.
139934	`FcipRoute#%d Failed with Network Configuration Error`	User	Error	Network device configuration failed; could not add or remove a network device instance. Verify the IP addresses, mask, gateway, and Ethernet port specified in the route definition
139935	`FcipRoute#%d Failed with Persistence Read Failure`	User	Error	Read of FCIP Route definition from persistent memory failed. Reboot the router

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
139936	`FcipRoute#%d Failed with Persistence Write Failure`	User	Error	Write of FCIP route definition to persistent memory failed. Retry the route add or modify if the retry failed reboot the router.
139937	`FcipRoute#%d Failed with IP Address Reuse Error`	User	Error	Specified IP address is already in use in another FCIP route definition. Verify that the address specified in the definition is correct. If you want to reuse the address, you must first remove it from the other route definition.
139938	`FcipRoute#%d Add Failed because relevant FCIP Licence not available`	User	Error	Router is not licensed for FCIP. Contact your sales representative for information on how to obtain a license
151842	`FW Upgrade performed: new version is: %d.%d.%d.%d`	User	Info	A firmware upgrade was performed, the new version is: *d.d.d.d*.
151843	`REBOOT/SHUTDOWN Command from user. Code=%d`	User	Info	User issued a REBOOT or SHUTDOWN command.
151889	`#%d: qapisetfcinterfaceparams_1_svc: FC port configuration changed`	User	Info	The Fibre Channel port configuration has changed.
151890	`#%d: qapisetiscsiinterfaceparams_1_svc: iSCSI port configuration changed`	User	Info	The iSCSI port configuration has changed.
151891	`#%d: qapisetisns_1_svc:iSNS configuration changed`	User	Info	The iSNS configuration has changed.
151892	`qapisetntpparams_1_svc: NTP configuration changed`	User	Info	The NTP configuration has changed.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
151893	`#%d: qapisetvlanparams_1_svc: VLAN configuration changed`	User	Info	The VLAN configuration has changed.
151894	`qapisetlunmask_1_svc: Lunmask added for LUN %d`	User	Info	A LUN mask was added for LUN %d.
151895	`qapisetlunmask_1_svc: Lunmask removed for LUN %d`	User	Info	The LUN mask was removed for LUN %d.
151896	`qapisetmgmintfcparams_1_svc:Management port configuration changed`	User	Info	The management port configuration has changed.
151897	`qapisetbridgebasicinfo_1_svc:Bridge configuration changed`	User	Info	The router configuration has changed.
151908	`GE%d: Port status changed by user to ENABLED.`	User	Info	GE port %d was enabled user.
151909	`GE%d: Port status changed by user to DISABLED.`	User	Info	GE port %d was disabled by user.
151910	`FC%d: Port status changed by user to ENABLED.`	User	Info	Fibre Channel port %d was enabled by user.
151911	`FC%d: Port status changed by user to DISABLED.`	User	Info	Fibre Channel port %d was disabled by the user.
151912	`qapimaptargetdevice_1_svc: Target WWPN: %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x mapped to iSCSI portal %d.`	User	Info	The target at WWPN: *xx.xx.xx.xx.xx.xx.xx.xx* has been mapped to iSCSI portal %d.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
151913	`qapimaptargetdevice_1_svc: Target WWPN: %.2x%.2x%.2x%.2x%.2x%.2x%.2x%.2x unmapped from iSCSI portal %d.`	User	Info	The target at WWPN: xx.xx.xx.xx.xx.xx.xx.xx has been unmapped from iSCSI portal %d
152082	`qapiaddmodifyinitiator_1_svc : Initiator Configuration Changed`	User	Info	An initiator's configuration has changed.
152083	`qapiremoveinitiator_1_svc : Initiator Removed`	User	Info	An initiator has been removed.
152096	`qapisetmigrfctargets_1_svc: Configuration Changed for migration target`	User	Info	A set array was done on one of the arrays.
152099	`LogMigration: Error in Writting log file`	User	Info	Encountered an error while updating the migration log entry. Some migration log entries might be missing.
152100	`qapiaddgroup_1_svc: Added Group with id %d`	User	Info	Group with ID specified in the log was added.
152101	`qapiremovegroup_1_svc: Removed Group with id %d`	User	Info	Group with ID specified in the log was removed.
152102	`qapiupdategroup_1_svc: Updated Group with id %d`	User	Info	Group with ID specified in the log was updated.
152103	`qapisetserialjobs_1_svc: Serial Time %lu`	User	Info	Serial schedule jobs scheduled to start at time specified in the log.
152104	`qapireadjustpriority_1_svc: Readjust Priority Failed on line %d with error %d`	User	Info	Readjust priority command completed with an error. Error code 2 indicates no scheduled jobs were found. Error code 16 indicates a job with priority 1 configured.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
152105	`qapireadjustpriority_1_svc: Readjust Priority Done`	User	Info	Completed readjusting the serial schedule priority of migration jobs.
152106	`qapiupdatemigration_1_svc: Update Migration returned with error %d`	User	Info	An update migration action [Start, Stop, Pause, or Resume] has failed.
152107	`RemoveMigration:%d with Job Id %d and error = %d`	User	Info	Failed to remove a migration job with ID specified in the log.
152108	`ValidateSerialSchedule: Previous time %ld New time %ld`	User	Info	Reset the serial schedule delayed time to invalid if the last serial schedule job was removed.
152109	`addMigration: Creating migration Job Failed with error %d`	User	Info	Failed to create a migration job.
152129	`sysTempMon: Left PCM Installed`	User	Info	The left PCM is or has been installed.
152130	`sysTempMon: Left PCM Un-installed`	User	Info	The left PCM is or has been uninstalled.
152131	`sysTempMon: Right PCM Installed`	User	Info	The right PCM is or has been installed.
152132	`sysTempMon: Right PCM Un-installed`	User	Info	The right PCM is or has been uninstalled.
152133	`sysTempMon: Power for Left PCM Plugged-in`	User	Info	The left PCM is connected AC power.
152134	`sysTempMon: Power for Left PCM Un-plugged`	User	Info	The left PCM is not connected to AC power (unplugged).
152135	`sysTempMon: Power for Right PCM Plugged-in`	User	Info	The right PCM is connected AC power.
152136	`sysTempMon: Power for Right PCM Un-plugged`	User	Info	The right PCM is not connected to AC power (unplugged).

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
152137	`sysTempMon: Slot 1 (R1) PCM Fan%d faulty`	User	Info	The left PCM (#1) is reporting a faulty fan.
152138	`sysTempMon: Slot 2 (R2) PCM Fan%d faulty`	User	Info	The left PCM (#1) is reporting a healthy fan.
152139	`sysTempMon: Slot 1 (R1) PCM Fan%d healthy`	User	Info	The right PCM (#2) is reporting a faulty fan.
152140	`sysTempMon: Slot 2 (R2) PCM Fan%d healthy`	User	Info	The right PCM (#2) is reporting a healthy fan.
152141	`sysTempMon: Over Temperature Front: %dC Rear: %dC CPU1: %dC CPU2: %dC`	User	Info	The router has detected an over-temperature, Front: %dC Rear: %dC CPU1: %dC CPU2: %dC
152142	`sysTempMon: Setting the fan speed to high`	User	Info	The fan(s) speed has been set to high.
152143	`sysTempMon: Setting the fan speed to normal`	User	Info	The fan(s) speed has been set to normal.
152144	`sysTempMon: Temperature back to safe value. Front: %dC Rear: %dC CPU1: %dC CPU2: %dC`	User	Info	The router temperature has returned to normal operating range, Front: %dC Rear: %dC CPU1: %dC CPU2: %dC
152145	`sysTempMon: Critical Temperature, Shutting Down Front: %dC Rear: %dC CPU1: %dC CPU2: %dC`	User	Info	The router has reached a critical temperature ad is shutting down, Front: %dC Rear: %dC CPU1: %dC CPU2: %dC
172040	`FcipRoute#%d: Cleaning FCIP Instance`	FCIP	Error	This is an informative message, not an error. This indicates an FCIP was removed or modified.
172231	`FcipRoute#%d: Did not get the keepalive msg form remote peer`	FCIP	Error	Connectivity with the remote peer has been interrupted check the Ethernet cabling and path to the remote peer.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
172238	`FcipRoute#%d: Synchronization Error on Receive`	FCIP	Error	Indicates an error in the received FCIP PDU framing; router will disconnect and reconnect with remote router to clear the error.
172239	`FcipRoute#%d: Decompression Error on Receive`	FCIP	Error	Indicates the receiver could not decompress a received FCIP frame. The router will disconnect and reconnect with the remote router to clear the error.
172240	`FcipRoute#%d: De-encapsulation Error on Receive`	FCIP	Error	Invalid FCIP header received. The header is invalid or improperly framed. The router will disconnect and reconnect with the remote router to clear the error.
172245	`FcipRoute#%d: Transmit Failure`	FCIP	Error	FCIP PDU transmit request was rejected, typically caused by the TCP connection closing when send was submitted. Can also be caused by lack of resources to accommodate the send (should never happen). If this persists and the TCP connection is up a reboot is required to clear the condition.
172246	`FcipRoute#%d: Remote Peer Disconnected`	FCIP	Error	The remote peer terminated the TCP connection via a FIN (finished) or RST (reset) flag. The router will attempt to restore the TCP connection.
172247	`FcipRoute#%d: Failed to send FC Up/Down`	FCIP	Error	Unable to notify the remote router that the local Fibre Channel link came up or went down. The TCP connection will be closed and the router will attempt to reconnect to the remote router.
172249	`FcipRoute#%d: FCIP Link Down`	FCIP	Error	The Fibre Channel link went down. Check the Fibre Channel cabling and Fibre Channel switch or drive statistics.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
172250	`FcipRoute#%d: TCP Link Down`	FCIP	Error	The TCP link went down. Check the Ethernet cabling and Ethernet switch or peer device statistics.
172253	`FcipRoute#%d: Remote Peer IP Address Validation Failed`	FCIP	Error	An TCP client attempted to connect to the router but the IP address did not match the address of the remote router specified in the route definition. Check the route definition; check for network rogues fishing for open TCP ports.
172272	`FcipRoute#%d: Tcp Client's connect attempt failed`	FCIP	Error	Router was not able to open a TCP connection with the remote router. Check the route definitions on each router; check the Ethernet cabling. Try to ping the remote router.
172273	`FcipRoute#%d: Tcp Server's Listen attempt failed`	FCIP	Error	TCP connection was closed before it was fully opened. Router will restart its listen socket.
184515	`FcipRoute#%d: TCP Link Up`	FCIP	Info	TCP connection was successfully established with remote router.
184536	`FcipRoute#%d: FCIP Link Up`	FCIP	Info	Local and remote Fibre Channel links are up.
184542	`FcipRoute#%d: VLAN Info Unavailable`	FCIP	Info	Route definition includes VLAN but the network VLAN device instance does not exist. This is an internal error. Try removing the route definition and re-enter the route definition.
200721	`QL3022:ql3xxx_probe: Adapter eth#%d, Invalid NVRAM parameters`	TOE	Fatal	A GE port (eth#%d) has invalid NVRAM parameters.

Table C-1. iSR6200 Router Log Messages (Continued)

ID	Log Message	Module Type	Msg. Type	Description
204835	`QL3xxx:eth%x PHY Downshift occurred`	TOE	Error	The Ethernet device could not successfully communicate with the link peer at the highest negotiated port rate. Check the Ethernet cabling and Ethernet switch statistics of the corresponding port.
204837	`QL3xxx:eth%x Link Down`	TOE	Error	The Ethernet link is down. Check the Ethernet cabling and Ethernet switch or remote peer statistics.
217124	`QL3xxx:eth%x Link Up`	TOE	Info	The Ethernet link is up.
233473	`"memory monitor: Detected Uncorrectable Ecc %08lx system is rebooting in 5 secs\n"`	System	Fatal	Uncorrectable memory error detected at address provided in log message.
233474	`"Failed to register interrupt handler!\n"`	System	Fatal	Attempt to register the interrupt handler failed.
233475	`"%s class_simple_create failed\n"`	System	Fatal	Failed `class_simple_create` system call from memory monitor initialization routine.
237572	`"Failed to kill sys killer %d\n"`	System	Error	Failed to kill system task.
237573	`Temperature over high threshold %d`	System	Error	The router temperature has exceeded the high temperature threshold.
249862	`Temperature is back to normal range %d`	System	Info	The router temperature has returned to the normal operating range.

Glossary

activity LED

A port LED that indicates when frames are entering or leaving the port.

adapter

The board that interfaces between the host system and the target devices. Adapter is synonymous with *host bus adapter*, *host adapter*, and a*dapter board*.

adapter port

A port on the adapter board.

adapter port beacon

An LED on the adapter. Flashing it enables you to locate the adapter.

alarm

A message generated by the switch that specifically requests attention. Alarms are generated by several switch processes. Some alarms can be configured.

arbitrated loop

A circular (ring) topology (versus point-to-point) where two or more ports can be interconnected, but only two ports can communicate at a time. All communication passes through all ports connected to the loop.

ASIC

Application specific integrated circuit. A microchip designed for special applications such as Fibre Channel.

bandwidth

A measure of the volume of data that can be transmitted at a specific transmission rate. A 2Gbps Fibre Channel port can transmit or receive at nominal rates of 2Gbps. This corresponds to actual bandwidth value of 212MB.

boot code

The program that initializes a system or an adapter. Boot code is the first program to run when a system or a device within a system, such as an adapter, is powered on. FCode, BIOS, and EFI (enhanced firmware interface) are all forms of boot code for specific hardware/operating system environments.

CHAP

Challenge-handshake authentication protocol. CHAP is used for remote logon, usually between a client and server or a Web browser and Web server. A challenge/response is a security mechanism for verifying the identity of a person or process without revealing a secret password that is shared by the two entities. Also referred to as a *three-way handshake*.

CLI

Command line interface. Program interface driven by entering commands and parameters.

comma separated values file

See CSV file.

command line interface

See CLI.

Converged Network Adapter

QLogic adapter that supports both data networking (TCP/IP) and storage networking (Fibre Channel) traffic on a single I/O adapter using two new technologies: Enhanced Ethernet and Fibre Channel over Ethernet (FCoE).

CRC

Cyclic redundancy check. A type of check value designed to catch most transmission errors.

CSV file

Comma separated values file. Each line in the file corresponds to a row in the table. Within a line, fields are separated by commas, each field belonging to one table column.

cyclic redundancy check

See CRC.

device

A target, typically a disk drive. Hardware such as a disk drive, tape drive, printer, or keyboard that is installed in or connected to a system. In Fibre Channel, a *target* device.

DHCP

Dynamic host configuration protocol (DHCP) enables computers on an IP network to extract their configuration from servers that have information about the computer only after it is requested.

driver

The software that interfaces between the file system and a physical data storage device or network media.

DS-1

Digital signal 1 (DS-1, also known as T1 and DS1) is a T-carrier signaling scheme that is a widely-used standard in telecommunications to transmit voice and data between devices. Technically, DS1 is the logical bit pattern used over a physical T1 line; however, the terms *DS1* and *T1* are often used interchangeably.

DS-3

Digital signal 3 (DS-3) is a digital signal level 3 T-carrier. It may also be referred to as a *T3 line*.

dynamic host configuration protocol

See DHCP.

E_Port

Expansion port. A port in a Fibre Channel switch that connects to another Fibre Channel switch or bridge device by an inter-switch link. E_Ports are used to link Fibre Channel switches to form a multi-switch fabric.

EEPROM

Electrically erasable programmable read-only memory. Memory that can be erased (entirely, not selectively) using higher electrical voltages.

Enhanced Ethernet

Also called *data center Ethernet* or *converged enhanced Ethernet*. Refers to new enhancements to the existing Ethernet standard that eliminate Ethernet's inherently lossy nature and make 10Gb Ethernet a viable storage networking transport.

F_Port

The *fabric* port in a Fibre Channel fabric switch provides a point-to-point link attachment to a single N_Port. F_Ports are intermediate ports in virtual point-to-point links between end ports, for example N_Port to F_Port to F_Port to N_Port using a single Fibre Channel fabric switch.

fabric

A fabric consists of cross-connected Fibre Channel devices and switches.

fabric port

See F_Port.

fabric switch

Also, switched fabric. A fabric switch connects multiple devices from independent Fibre Channel-arbitrated loops (FC-ALs) and point-to-point topologies into a fabric using Fibre Channel switches.

failover path

Software feature that ensures data availability and system reliability by assigning alternate path and automatic adapter failover for device resources. This feature is available only in Windows 2000/Windows Server 2003/Windows Vista, Novell NetWare, and Red Hat/SUSE Linux. (Windows XP and Windows Server 2008 do *not* support failover.)

FC

See Fibre Channel.

FC-IP mode

Data transportation mode in which the iSR6200 transports Fibre Channel frames over a TCP/IP connection using the FCIP protocol to connect two iSR6200 routers. In FC-IP mode, a port pair (one Fibre Channel port and an IP port on the same router) on local iSR6200 and another port pair on a remote router form an FCIP route.

FCIP

Fibre Channel over IP. Protocol that enables transmission of Fibre Channel information by tunneling data on a SAN over IP networks. An alternative to iSCSI. Also known as Fibre Channel tunneling.

FCoE

Fibre Channel over Ethernet. A new technology defined by the T11 standards body that allows traditional Fibre Channel storage networking traffic to travel over an Ethernet link by encapsulating Fibre Channel frames inside Layer 2 Ethernet frames. For more information, visit www.fcoe.com.

Fibre Channel

A high-speed serial interface technology that supports other higher layer protocols such as SCSI and IP.

field replaceable unit

See FRU.

FL_Port

Fabric loop port. In a Fibre Channel, the fabric switch is capable of Fibre Channel arbitrated loop operations and is connected to one or more NL_Ports by a Fibre Channel Arbitrated Loop. An FL_Port becomes a shared entry point for public NL_Port devices to a Fibre Channel fabric. FL_Ports are intermediate ports in virtual point-to-point links between end ports that do not reside on the same loop, for example NL_Port to FL_Port to F_Port to N_Port through a single Fibre Channel fabric switch.

Flash

Non-volatile memory where the boot code is saved. At times, Flash and boot code are used interchangeably.

Flash BIOS

A QLA2*xxx* adapter's flash programmable read-only memory (PROM) contains the code that allows booting from the adapter at startup.

frame

Data unit consisting of a start-of-frame (SOF) delimiter, header, data payload, CRC, and an end-of-frame (EOF) delimiter.

FRU

Field replaceable unit. Component that can be replaced in the field upon failure.

G_Port

Generic port. A port that can operate as either an E_Port or an F_Port. A G_Port can determine operating mode at switch port initialization, F_Port when an N_Port attachment is determined, E_Port when an E_Port attachment is determined. See E_Port, F_Port, FL_Port, L_Port, N_Port, NL_Port.

GBIC

Gigabit interface converter. Removable transceiver module that permits Fibre Channel and Ethernet physical layer transport.

Gbps

Gigabits per second. A measure of data transfer rates.

gigabit interface converter

See GBIC.

HA

High availability. HA refers to a system or device that operates continuously for a long length of time.

Host Bus Adapter

See adapter.

heartbeat LED

A chassis LED that indicates the router status.

high availability

See HA.

hot replaceable

Also known as *hot swappable*, this means you can add new devices or remove existing ones when the system is running.

IANA

Internet Assigned Numbers Authority (IANA) is responsible for the global coordination of the DNS Root, IP addressing, and other Internet protocol resources.

initiator

System component, such as a network interface card, that originates an I/O operation.

ioctl

Input/output control. A system call in UNIX®/Linux systems that allows an application to control or communicate with a device driver outside usual read/write operations.

IP

Internet Protocol. A method by which data is sent from one computer to another over the Internet. IP specifies the format of packets, also called *datagrams*, and the addressing scheme.

iSCSI

Internet small computer system interface. Protocol that encapsulates data into IP packets to send over Ethernet connections.

iSNS

Internet simple name service (iSNS) is used for discovery and management of IP-based SANs.

L_Port

Loop port. Does arbitrated loop functions and protocols. NL_Ports and FL_Ports are examples of loop-capable ports. See E_Port, F_Port, FL_Port, G_Port, N_Port, NL_Port.

latency

A measure of how fast a transaction travels through the router.

LED

Light emitting diode. Status indicator on a switch or other device.

light emitting diode

See LED.

LIP

Loop initialization process. The initialization process in an arbitrated loop that occurs when the loop is powered up or a new device is added. One function of a LIP is to assign addresses. All data transmission on the loop is suspended during a LIP.

load balancing

A software feature that improves system performance by balancing device access between multiple ports for maximum resource efficiency.

logical unit number

See LUN.

loop initialization process

See LIP.

loopback

Diagnostic tool that routes transmit data through a loopback connector back to the same adapter.

LUN

Logical unit number, a subdivision of a SCSI target. It is the small integer handle that differentiates an individual disk drive or partition (volume) within a common SCSI target device such as a disk array.

Technically, a LUN can be a single physical disk drive, multiple physical disk drives, or a portion (volume) of a single physical disk drive. However, LUNs are typically not entire disk drives but rather virtual partitions (volumes) of a RAID set.

Using LUNs, the Fibre Channel host can address multiple peripheral devices that may share a common controller.

maintenance button

Multifunction momentary switch on the front panel of the router.

management workstation

PC workstation used to manage routers remotely by connecting to the routers using SANsurfer Router Manager or CLI commands.

maximum transmission unit

See MTU.

Mbps

Megabits (millions of bits) per second. A measure of data transfer rates.

media

Physical-layer information carriers. Fibre Channel supports several different physical media: copper, multimode optical, and single-mode optical. All Fibre Channel protocols are supported on all media.

MIB

Management information base. A set of guidelines and definitions for SNMP functions.

mid-plane

Located inside the iSR6200 chassis between the blades and their corresponding PCMs, the mid-plane connects the removable power supply and the iSR6200 blades.

MTU

Maximum transmission unit. Refers to the size (in bytes) of the largest packet ((IP datagram) that a specific layer of communications protocol can transfer.

N_Port

Node port. Connects by a point-to-point link to either a single N_Port or a single F_Port. N_Ports handle creation, detection, and flow of message units to and from the connected systems. N_Ports are end ports in virtual point-to-point links through a fabric, for example N_Port to F_Port to F_Port to N_Port using a single Fibre Channel fabric switch. See also Fibre Channel.

network time protocol

See NTP.

NIC

Network interface card. Computer card installed to enable a dedicated network connection.

NL_Port

Node loop port. A port capable of arbitrated loop functions and protocols. An NL_Port connects through an arbitrated loop to other NL_Port and at most a single FL_Port. NL_Ports handle creation, detection, and flow of message units to and from the connected systems. NL_Ports are end ports in virtual point-to-point links through a fabric, for example NL_Port to F_Port to F_Port to N_Port using a single Fibre Channel fabric switch. In the absence of a fabric switch FL_Port, NL_Ports can communicate with other NL_Ports in virtual point-to-point links through an FC_AL open loop circuit often through FC_AL (Arbitrated Loop) hub or loop switch devices. See: E_Port, F_Port, FL_Port, G_Port, N_Port.

non-volatile random access memory

See NVRAM.

NTP

Network time protocol. NTP is used for distributing the Coordinated Universal Time (UTC) by means of synchronizing the clocks of computer systems over packet-switched, variable-latency data networks.

NVRAM

Non-volatile random access memory. NVRAM is a type of memory that retains data (including configuration settings) even when power is removed. You can configure NVRAM settings manually or restore them from a file.

OC

Optical carrier is a standardized set of specifications of transmission speeds that describe a range of digital signals that can be carried on synchronous optical networking (SONET) fiber optic networks. The number attached to the optical carrier abbreviation, OC-12, is directly proportional to the data rate of the bitstream of the digital signal.

path

A path to a device is a combination of a adapter port instance and a target port as distinct from internal paths in the fabric network. A fabric network appears to the operating system as an opaque network between the adapter (initiator) and the target.

Because a path is a combination of an adapter and a target port, it is distinct from another path if it is accessed through a different adapter and/or it is accessing a different target port. Consequently, when switching from one path to another, the driver might be selecting a different adapter (initiator), a different target port, or both.

This is important to the driver when selecting the proper method of failover notification. It can make a difference to the target device, which might have to take different actions when receiving retries of the request from another initiator or on a different port.

PCI

Peripheral component interface/interconnect. A 32-bit local bus specification introduced by Intel.

PCM

Power and cooling module. A device that consists of one power supply and three fans.

PID

Process identifier. A number used by some operating system kernels (such as that of UNIX, Mac OS X or Windows NT) to uniquely identify a process.

ping

A computer network administration utility used to test whether a specified host is reachable across an IP network and to measure the round-trip time for packets sent from the local host to a destination computer.

point-to-point

Also FC-P2P. Two Fibre Channel nodes directly connected (not in a loop).

port

Access points in a device where a link attaches. There are four types of ports, as follows:

- N_Port—a Fibre Channel port that supports point-to-point topology.
- NL_Port—a Fibre Channel port that supports loop topology.

- Fibre Channel—a port in a fabric where an N_Port can attach.
- Fibre Channel—a port in a fabric where an NL_Port can attach.

port instance

The number of the port in the system. Each adapter may have one or multiple ports, identified with regard to the adapter as port 0, port 1 and so forth. To avoid confusion when dealing with a system containing numerous ports, each port is assigned a port instance number when the system boots up. So Port 0 on an adapter might have a port instance number of 8, for example, if it is the eighth port discovered by the system.

POST

Power-on self test. Diagnostics that the router performs at start-up.

reduced instruction set computer

See RISC.

registered state change notification

See RSCN.

RISC

Reduced instruction set computer. A computer microprocessor that performs fewer types of computer instructions, thereby operating at higher speeds.

RSCN

Registered state change notification. RSCN is a Fibre Channel fabric notification sent to all specified nodes when any major fabric changes occur. This notification allows nodes to immediately gain knowledge about the fabric and react accordingly.

router log

Log of messages describing events that occur on the intelligent Storage Router (iSR).

SAN

Storage area network. Multiple storage units (disk drives) and servers connected by networking topology.

SANsurfer Router Manager

Workstation-based router management utility that provides a graphical user interface (GUI) used to configure and monitor intelligent Storage Router (iSR)s.

SCSI

Small computer system interface. A high-speed interface used to connect devices, such as hard drives, CD drives, printers, and scanners, to a computer. The SCSI can connect many devices using a single controller. Each device is accessed by an individual identification number on the SCSI controller bus.

Secure SHell

See SSH.

SFF

Small form factor. A transceiver device that is permanently attached to the circuit board.

SFP

Small form-factor pluggable. A transceiver device, smaller than a GigaBit Interface Converter, that plugs into the Fibre Channel port.

simple network management protocol

See SNMP.

small computer system interface

See SCSI.

small form factor

See SFF.

small form-factor pluggable

See SFP.

SMI-S

Storage management initiative–specification. A standard that provides for the management of the switch through third-party management applications.

SNMP

Simple network management protocol. SNMP is a networking protocol that enables you to monitor the router using third-party applications that use SNMP.

SSH

Secure SHell. Communications tool that provides secure and encrypted connections to traditionally non-encrypted services.

storage area network

See SAN.

storage management initiative–specification

See SMI-S.

T1

See DS-1.

T3

See DS-3.

target

The storage-device endpoint of a SCSI session. Initiators request data from targets. Targets are typically disk-drives, tape-drives, or other media devices. Typically a SCSI peripheral device is the target but an adapter may, in some cases, be a target. A target can contain many LUNs.

A target is a device that responds to a requested by an initiator (the host system). Peripherals are targets, but for some commands (for example, a SCSI COPY command), the peripheral may act as an initiator.

Telnet

Telecommunication network. A network protocol used on the Internet or local area network (LAN) connections. Telnet provides access to a command line interface (CLI) on a remote machine.

virtual logical area network (LAN)

See VLAN.

virtual port group

See VPGs.

VLAN

Virtual logical area network (LAN). A group of hosts with a common set of requirements that communicate as if they were attached to the same wire, regardless of their physical location. Although a VLAN has the same attributes as a physical LAN, it allows for end stations to be grouped together even if they are not located on the same LAN segment. VLANs enable network reconfiguration through software, instead of physically relocating devices.

VPGs

Virtual port group. VPG is the iSR6200 software component used to create additional logical Fibre Channel adapter initiator ports on the fabric.

world wide node name

See WWNN.

world wide port name

See WWPN.

world wide unique LUN name

See WWULN.

WWNN

World wide node name. Unique 64-bit address assigned to a device.

WWPN

World wide port name. Unique 64-bit address assigned to each port on a device. One WWNN may contain multiple WWPN addresses.

WWULN

World wide unique LUN name identifiers for SCSI devices are read from page 83 and page 80 of your SCSI block device as based on the SCSI standard. SANsurfer looks for identifiers in the order of: page 83 type 3, page 83 type 2, page 83 type 1, page 80, and lastly page 83 type 0.

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